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Brain Activation Using Brain Gym for Effective Learning

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Abstract

This study attempts to find out the effectiveness of brain activation using brain gym training in learning educational psychology. Brain Gym comprised of six basic exercises that helps to improve cognitive function and learning. It consists of a series of simple body movements that help to cajole the two hemispheres of the brain into working in unison. This is an experimental study that compares the impact of two teaching approaches (brain gym and conventional method). The intervention lasted for two weeks. The post-test-only rotational group design study included 90 students, 45 in the experimental group (Brain gym) and 45 in the control group (Conventional method). To ensure the similarity of the groups an entry level test was conducted and the scores obtained were compared using t test. The data were analysed using SPSS and the results indicated that brain gym had a significant effect on learning.

Keywords: *Brain Gymnastics, Brain Gym Exercises, Cognitive Functions, Learning Process, Learner Centered Classroom*

1. Introduction

Brain activation exercises are activities and techniques that can help stimulate and improve cognitive function, memory, and overall brain health. Engaging in activities like crossword puzzles, Sudoku, chess, and brain-teaser games and by involving in regular physical activity, such as aerobic exercises and yoga, can improve blood flow to the brain, leading to better cognitive function. Whether it's playing a musical instrument, learning a new language, or picking up a new hobby, acquiring new skills stimulates the brain. This made the investigator to think of different brain exercises which enhances the cognitive ability of the students.

In an analysis, the present-age student teachers' perspective is different from the preceding ones. This is attributed to various factors involved in their life, which include the residing environment, educational, psychological and emotional conditions of the parents, their way of life, the usage rate of electronic gadgets, everyday routine, and many other incidents occurring at the social and financial levels and school environment. They need to satisfy the younger generation in their school classrooms. Aparna and Smita (2014) examined that using Brain Gym exercises helped students attain academic success and yielded outstanding outcomes.

Brain Gym exercises, commonly known as motor skills training exercises, stimulate the brain's ability to balance the stress caused by specific memories, situations, individuals, places, and skills. Brain Gym exercises can improve academic and behavioural performance by activating both hemispheres of the brain through neural repatterning to strengthen the learning process of the whole brain (Abduh and Tahar 2018). Brain Gym exercises' intervention is usually performed for students with developmental disabilities such as attention deficit hyperactivity disorder (ADHD), dyspraxia, dyslexia, and autism spectrum disorder (ASD). According to the research literature, this intervention can dramatically improve concentration, memory, reading scientific and educational resources, writing, mathematics, taking tests, physical coordination, relationships, personal responsibility, and organizational attitudes and skills (Bayanfar and Tabatabaee 2019).

The student may easily be impacted in all negative ways unless these living conditions are positive. Researchers have also proved that students of the present generation are highly stressed out due to the

compulsive academic rules and regulations of the schools, which is not a good learning environment (Lombardi et al. 2021). In one well-known recent experiment, stressful assessments and tests seem to bring constant pressure on the students, which in turn bring an even erosive attitude toward learning in the school environment. Since the field of education is capable to elevate new ages with the skills and abilities to manage every one of the previously given conditions, education before all these technical developments tend to be solely dependent on teachers' descriptions and explanations, and this has to be changed into a new paradigm that permits students to be autonomously attempting to discover solutions and to be sufficient at critical thinking and different abilities. To handle the students effectively, the researcher practiced Brain Gym training for student teachers.

Both internal and external factors might influence a student's ability to focus. Internal elements that contribute to tension throughout the academic process at school include kids feeling uncomfortable when they sit stationary for an hour or more in a row of desks looking forward. The lack of energy flow to the brain caused by this strain is seen in how easily children get bored and worn-out during studying. Students' extensive involvement in extracurricular activities, which leads them to undertake several tasks that exhaust the brain, is one example of an external factor (Heni and Nurlika 2021). The ability to concentrate on the subject being studied can affect how well a learning process goes. The learning process cannot exist or function properly without focus since concentration is necessary for learning (Kamila et al. 2022).

Brain Gym exercises makes the teacher a person who facilitates a learner-centered classroom, which makes the class active and project-based and able to accomplish this goal, educators need to ensure that all students are prepared to learn despite any external contemplations and issues. Student teachers take this Brain Gym training as role model classes and the same can be implemented in the schools in the future (Mojarad and Dehghanizade 2021). This can be achieved by the support of school administrators and management who ought to encourage the interaction of teachers meeting and examining classroom issues and difficulties with educational experts, psychologists, counsellors and people who are experts in educational speculations, and interventions to assist them. To establish a proper classroom atmosphere, a teacher must not only have an up-to-date solid knowledge base of the given subject, but also classroom management skills.

Brain Gym is a set of exercises designed to improve and strengthen cognitive function for learning, to link the body and the mind, and to stimulate the usage of the brain's hemispheres through physical and mental tactics. It is a branch of kinesiology and the product of applied neuroscience research that examines bodily motions and how they relate to brain activity. Additionally, it arouses and activates each person's unique cognitive functions (Ramos-Galarza et al. 2023).

Humans can improve their brain function by using an exercise called Brain Gym. Brain exercises can increase blood flow to the brain, enhancing memory, concentration, balance, and coordination. The goal of brain gymnastics is to widen the brain's physiological channels in order to enhance learning capacity. Concentration, attentiveness, awareness, and the brain's capacity for movement planning can all are enhanced via brain gymnastics. Prior information helps people apply their cognitive skills more effectively. In order to effectively finish tasks, brain gymnastics can be helpful (Kurniawan and Maryanti, 2020).

Need and Significance of the Study

One of the fundamental goals of an educational system is to impart knowledge. In a classroom, a teacher must successfully transmit the notion to the pupils' minds. In education, a variety of teaching approaches are used to impart ideas, principles and concepts. However, the traditional method is widely used in the higher education system. The majority of student teachers in this area rely solely on traditional study to gain expertise. Lecturing is one of the earliest teaching methods, and it is still the most often used instructional strategy today. Students receive knowledge passively in traditional learning. It is a transitional phase, with numerous adjustments to teacher education curricula by NCTE 2014 standards. As a result, learning should be modified from its traditional style to meet the demands of students in the classroom. So, the researcher tried Brain Gym training before teaching the psychological concepts in everyday classes.

Learning is made more enjoyable when there is positive student-teacher interaction. Students comprehend faster if the lecturer presents the subject matter or teaches in a style that is appealing to them. Most college students nowadays are unable to concentrate when lecturing. To prepare student teachers to learn in that particular class, the investigator designed a Brain Gym training for their research. The result of an independent variable introduced in the study is referred to as effectiveness.

Brain Gym is a set of motions performed with the purpose of 'waking up' or stimulating brain activity. Its main goal is to help students study more effectively and organise their thoughts. These are basic workouts that everyone may do at home, at work, or at school, according to the concept. They are made to improve the connection between the body and the mind. Educational Psychology is one of the primary core papers in the Tamil Nadu Teachers Education University's B.Ed. program. There is a significant role for growth and development, as well as theories, in their development, and student teachers find it difficult to acquire psychological terms. As a result, the researcher used Brain Gym training to get students' minds ready for learning. Students pursuing a Bachelor's Degree in Education (B. Ed) in the Indian educational system are referred to as 'student teachers.

2. Literature Review

According to Basuki and Faizah (2020), using Brain Gym activities can make a significant contribution to increasing the concentration in student learning. Brain Gym can be carried out by students, just before the lesson/lecture or in the middle of the lesson, and the implementation time is approximately 10-15 minutes. Pratiwi and Pratama's (2020) study found that students can improve their concentration in learning by practising Brain Gym regularly. Students can practise Brain Gym exercises at least 3 times a week at home during the ongoing pandemic situation or before starting live classes once the pandemic has ended. Saleh and Mazlan's (2019) study found the important triggers for better understanding of Physics concepts and for excelling in the subject. Apandi (2019) study found that the Brain Gym method is effective in reducing burnout in student learning. In a study conducted by Abduh and Tahar (2018), the results showed a significant improvement in the working memory function in both intervention groups.

Objectives of the Study

The objectives of this study were to:

- Investigate the efficacy of Brain Gym training in learning of educational psychology among student teachers.
- Compare the efficacy of Brain Gym training in learning of educational psychology among student teachers based on their locality.

Hypotheses of the Study

The hypotheses of the study were that:

- There is no significant effect in the mean scores of Brain Gym training for learning educational psychology in B.Ed. curriculum between the control and experimental student teachers.
- There is no significant effect in the mean scores of Brain Gym training for learning educational psychology in B.Ed. curriculum between the control and experimental students with respect to locality.

3. Materials And Methods

An experimental design is used by the investigator. It allows the researcher to make the comparisons necessary to the experiment's hypotheses, and it allows the production of a coherent interpretation of the study's outcomes using statistical analysis of the data. For the current investigation, a post-test-only rotational group design was chosen.

Study Sample

The participants in this study comprise 90 student teachers enrolled in Dr. SNS College of Education in Coimbatore, Tamil Nadu, India. The sample was chosen using the cluster sampling method followed by random sampling. Then the entry level test (based on their knowledge in Educational Psychology) was conducted and the sample was divided into two groups with 45 student teachers each in experimental group (Brain gym) and control group (Conventional method) in the first stage of intervention.

Research Design

The Posttest Only Rotational Group Design was used for the study

Table 1: Sample distribution in the first stage of intervention

Group	*Sample*	*Sample size*	*Treatment variable*
Control	Dr. SNS College of Education SECTION A	45	Conventional method

Experimental	Dr. SNS College of Education SECTION B	45	Brain Gym training

Table 2: Sample distribution in the second stage of intervention

Group	*Sample*	*Sample size*	*Treatment variable*
Control	Dr. SNS College of Education SECTION B	45	Conventional method
Experimental	Dr. SNS College of Education SECTION A	45	Brain Gym training

Tools Used for the Study

The investigator employed self-developed and validated Achievement tests in educational psychology and entry level test on basic educational psychological concepts. Both the tools were checked for face validity and content validity by giving them to four experts in the field of Education and psychology and the reliability of the tools were found to be 0.79 and 0.82 respectively.

The investigator also used a brain gym training module adapted based on (Denison & Dennison, 1987) with six exercises

Intervention procedure

Brain gym is the process by which the learner constructs knowledge and meaning from the collaboration between their day-to-day activities and their reflective thoughts. The Course paper Educational Psychology from the first year B.Ed., Syllabus, 3 units had been taken for the Intervention programmed of the experimental research. The areas selected for the Brain Gym Module is Laterality, Focusing and Centering. (LFC). The module is entitled as "Brain Elite–Work on you for yourself". The researcher followed six exercises for intervention, which are "Think of X", "Lazy eight", "Earth Buttons", "Cross Crawls", "Cook hook up" and "the Owl". The intervention was carried out for two weeks (6 days in a week) with 6 basic brain exercises, of which, two exercise is related to laterality of brain, the next two to centering and the last two exercises are related to focusing areas of brain. Although efficient connections among various parts of the brain may foster cognitive development, the researcher utilized all the laterality, focusing and centering exercises for both weeks for the activation of right, left front, back, top and bottom of the brain for 45 minutes every day morning. After the intervention for two weeks, the academic achievement test was administered and the scores were entered in data sheet.

A gap of two weeks was given and again the intervention was carried out by rotating the group. The previous control group in first stage of intervention became the experimental group and the experimental group was treated as control group. After two weeks of intervention a parallel achievement test was administered and the scores were entered in data sheets and the analysis was carried out. During the experiment, the control group was only taught using traditional methods. However, in the experimental group, educational psychology was taught via the traditional manner, and students were also required to do Brain Gym training prior to receiving lecture instruction. Student teachers excitedly completed the Brain Gym training and began attentively listening to the class.

3. Results and Discussion

The data were anlysed using SPSS trial version and the results obtained are given in Table 3,4, 5 and 6.

Comparison of Achievement scores in stage one of intervention

The academic achievement scores obtained by student teachers in educational psychology of control and experimental group in the first stage of intervention is given in Table 3.

Table 3: Achievement scores in stage one of intervention

Group	*N*	*Mean*	*S.D.*	*df*	*'t' Value*
Control	45	11.31	1.47	88	13.57*
Experimental	45	15.94	1.58		

*(p > 0.01 level), N= Number, SD= Standard Deviation

From Table 3, the t value obtained t=13.57, indicated that there is a highly significant difference in the academic achievement of student teachers in control and experimental group. The mean value 15.94 obtained by students in the experimental group is found to be greater than the mean value 11.31 obtained by the control group indicating that brain gym training is better than the conventional method of

teaching educational psychology. Hence, the result shows that the Brain Gym training is effective for learning educational psychology in B.Ed. curriculum.

Locale wise comparison of effectiveness of Brain gym

The academic achievement scores obtained by student teachers in educational psychology of control and experimental group in the first stage of intervention based on their residential locality ws compared and the results are given in Table 4

Table 4: Achievement scores in stage one of intervention

Variable	*Sub variable*	*Group*	*N*	*M*	*S.D.*	*'t' Value*
Locality	Rural	Control	29	11.12	1.53	17.24*
		Experimental	24	17.05	0.79	
	Urban	Control	18	11.64	1.34	6.50*
		Experimental	19	14.56	1.15	

*(p > 0.05 level), N= Number, SD= Standard Deviation

Research question 1 indicated that there will be a significant difference between control and experimental group students in their mean scores based on student teachers' locality at Phase 1 given the mean and SD of the rural students of the control group (M=11.12 and SD= 1.53) and experimental group (M=17.05 and SD=0.79). The't' value of rural students is 17.24 at 0.01 level of significance. Hence, the result of the experimental group of rural students shows that the Brain Gym training is effective for learning educational psychology in B.Ed. curriculum.

The mean and SD of the urban students of the control group is M=11.64 and SD= 1.34, and the experimental group is M=14.56 and SD=1.15. The't' value of urban students is 6.50 at 0.05 level of significance. Hence, the result of the experimental group of urban students shows that the Brain Gym training is effective for learning educational psychology in B.Ed. curriculum. The experimental group is better than the control group in their mean scores both rural and urban. Hence, the Brain Gym training is effective for learning educational psychology in B.Ed. curriculum based on locality.

Comparison of Achievement scores in second stage of intervention

The academic achievement scores obtained by student teachers in educational psychology of control and experimental group in the first stage of intervention is given in Table 5.

Table 5: Achievement scores in second stage of intervention

Group	***N***	***Mean***	***S.D.***	***Df***	***'t' value***
Control	45	11.03	1.42	88	11.87*
Experimental	45	15.55	1.95		

*(p > 0.01 level), N= Number, SD= Standard Deviation

Research question 2 indicated that there will be a significant difference between control and experimental group students in their mean scores at phase 2 given the mean and SD of the control group (M=11.03 and SD=1.42) and experimental group (M=15.55 and 1.95). The't' value of rural students is 11.87 at 0.05 level of significance. The experimental group is better than the control group in their mean scores. Hence, the Brain Gym training is effective for learning educational psychology in B.Ed. curriculum.

Table 6: Difference between control and experimental group based on locality in Phase 2

Variable	*Sub Variable*	*Group*	*N*	*M*	*S.D.*	*'t' Value*
Locality	Rural	Control	24	11.05	1.53	7.78*
		Experimental	29	15.19	2.15	
	Urban	Control	19	11	1.33	11.09*
		Experimental	18	16.21	1.31	

*(p > 0.01 level), N= Number, SD= Standard Deviation

Research question 2 indicated that there will be a significant difference between control and experimental group students in their mean scores based on student teachers' locality at phase 2 given the mean and SD of the rural students of the control group (M=11.05 and SD= 1.53) and experimental group (M=15.19 and SD=2.15). The 't' value of rural students is 7.78 at 0.05 level of significance. Hence, the result of the experimental group of rural students shows that the Brain Gym training is effective for learning educational psychology in B.Ed. curriculum.

The mean and SD of the urban students of the control group is M=11 and SD= 1.33, and for the experimental group is M=16.21 and SD=1.31. The 't' value of urban students is 11.09 at 0.05 level of significance. Hence, the result of the experimental group of urban students shows that the Brain Gym training is effective for learning educational psychology in B.Ed. curriculum based on urban students.

The experimental group is better than the control group in their mean scores of both rural and urban areas. Hence, the Brain Gym training is effective for learning educational psychology in B.Ed. curriculum based on locality.

From Phase 1 and Phase 2, student teachers who learned educational psychology through Brain Gym training showed better performance than the student teachers who learned by the conventional method. Fanny (2009) revealed the many benefits could be obtained by doing Brain Gym exercises. Light movements with games through the hands and feet can provide stimulation or a stimulus to the brain. Pratiwi and Pratama's (2020) state that Brain Gym significantly affects elementary students' concentration. Anggraini and Dewi (2022) states that Brain Gym is a movement done by stimulating brain waves through light movements involving the hands and feet. Movements generated from the brain gym can provide a stimulus to the brain to increase the ability to study and concentrate in students because all brain parts are used to learn and concentrate. Brain Gym training is an important component of memory, multitasking, processing speed, and audio-visual processing. The role of the cognitive process of learning is activated only through Brain Gym training. Brain Gym's effectiveness in training in educational psychology has been tested and proven to be effective. The experiment proved that training in learning educational psychology is effective. When compared to the performance of the control group, the student teachers who received training in this mode demonstrated a greater grasp of the psychological concepts. The observation and inference can be extended logically to other subjects, such as contemporary India and education, teaching and learning, language across the curriculum, and pedagogy. This study indicated that students who received 'Brain Gym training' as an intervention demonstrated greater improvements in learning educational psychology concepts compared to those who did not receive the intervention. It is recommended that the time allotted for the use of Brain Gym training can be extended for the enhancement of learning achievement among students. Brain Gym training can also be used to train children with disability or special needs. More research is needed to raise awareness of 'Brain Gym' among educators and provide additional assurance to those considering it. It is necessary to conduct research on the effects of 'Brain Gym' as a secondary and tertiary intervention, as well as to assess efficacy with school-level students.

When brain exercises, which includes Brain physiology and brain anatomy which concentrates on the study of the normal functioning and processes of the brain based on the structure and function of the brain gives more clarity in deciding the type of brain exercises which stimulates the different areas of brain, this helps in the overall development of a human being involving physical, social, emotional and cognitive aspects.

4. Conclusion

This study found that Student, teachers who received educational psychology instruction via Brain Gym training outperformed their counterparts who were taught using the conventional method.

Limitation:

This study was limited by its small sample size, which means that the results may not be generalizable to the wider population. Therefore, it is important to replicate this study in other settings with larger samples to confirm the findings.

Ethical approval:

This study was conducted in accordance with the Declaration of Helsinki-Ethical principle for research involving human subjects. Accordingly, the ethical clearance was obtained from Institutional Human Ethics Committee, Avinashilingam Institute for Home Science and Higher Education for women, Coimbatore Tamilnadu vide reference no: AUW/IHEC/EDU-20-21/XPD-04 dated 07-12-2021. All individuals who took part in the study gave their informed consent, and data confidentiality was ensured.

Data availability:

All datasets generated or analyzed during this study are included in the manuscript.

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Conflicts of interest: No potential conflict of interest was reported by the authors.

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Authors' contributions:

G. Maheshwari had the idea for this study, the principal investigator of the research work, performed data collection and edited the manuscript. **Dr.H. Indu,** designed the study protocol, conducted the analyses and drafted the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work. All authors have read and agreed to the published version of the manuscript.

References:

Rebolledo, M., De la Cruz, A., Ibarra, R., & Hernández, K. (2018). Arterial hypertension and chronic renal failure: stomatological repercussions, a review. *Av Odontoestomatol*, *34*(4), 175-182. DOI: https://doi.org/10.201.159.223.1802

Quiroz, C. (2015). Oral alterations in odontologically treated patients with chronic renal failure. *University of Guayaquil Faculty of Dentistry*, *1*(43). DOI: https://doi.org/10.201.159.223.1803

Serra, M., Serra, M., & Viera, M. (2018). Chronic noncommunicable diseases: current magnitude and future trends. *Rev. Finlay*, *8*(2), 140-148. DOI: https://doi.org/10.201.159.223.1804

Costa, G., Pinheiro, M., Medeiros, S., Costa, R., & Cossi, M. (2016). Quality of life in patients with chronic renal failure on hemodialysis. *Sick. Glob.*, *15*(43), 59-73. DOI: https://doi.org/10.201.159.223.1805

Flores, J., et al. (2009). Chronic kidney disease: classification, identification, management, and complications. *Rev Med Chile*. DOI: https://doi.org/10.201.159.223.1806

Sellarés, L., & Rodríguez, L. (2022). Nefrología al día. Chronic kidney disease. DOI: https://doi.org/10.201.159.223.1807

Matos, G., Libertad, M., Álvarez, B., Lilié, R., & González, J. (2019). Therapeutic adherence of patients with Chronic Renal Insufficiency in dialysis treatment. *Rev haban cienc méd*, *18*(4), 666-677. DOI: https://doi.org/10.201.159.223.1808

Díaz, M., Gómez, B., Robalino, M., & Lucero, S. (2018). Epidemiological behavior in patients with end-stage chronic kidney disease in Ecuador. *ccm*, *22*(2), 312-324. DOI: https://doi.org/10.201.159.223.1809

Ministry of Public Health of Ecuador. (2018). Prevention, diagnosis, and treatment of chronic kidney disease. Clinical practice guideline. DOI: https://doi.org/10.201.159.223.1810

Vizuete, M., Dona, M., Gordon, D., Sempertegui, D., Sosa, M., & Singo, C. (2018). Oral health status in patients with chronic renal failure under hemodialysis. *Rev. Odont. Mex*, *22*(4), 206-213. DOI: https://doi.org/10.201.159.223.1811

Jung, Y., Martins, L., & Caldas, C. (2017). Avaliação da condição e risco periodontal em pacientes com doença renal crônica em hemodiálise. *Rev Scielo Br*. DOI: https://doi.org/10.201.159.223.1812

Dannewitz, B., Sommerer, C., Stölzel, P., Baid-Agrawal, S., Nadal, J., Bärthlein, B., ... & Jockel-Schneider, Y. (2020). Status of periodontal health in German patients suffering from chronic kidney disease-Data from the GCKD study. *Journal of Clinical Periodontology*, 47(1), 19-29. DOI: 10.1111/JCPE.13208

Gichki, A. S., Ahmed, K., & Ali, N. A. (2020). Oral findings in chronic kidney disease in Nephrology Department Sandeman Provincial Hospital, Quetta. *Journal of Saidu Medical College*, 9(2). Read Article

Amara, L., Koppolu, P., & Jyothi, P. (2017). Oral health in diabetic and nondiabetic patients with chronic kidney disease. *PubMed*, 1-7. Read Article

Yuan, Q., Xiong, Q. C., Gupta, M., López-Pintor, R. M., Chen, X. L., Seriwatanachai, D., ... & Gong, P. (2017). Dental implant treatment for renal failure patients on dialysis: a clinical guideline. *International Journal of Oral Science*, 9(3), 125-132. DOI: 10.1038/ijos.2017.23

Ruokonen, H., Nylund, K., Meurman, J. H., Heikkinen, A. M., Furuholm, J., Sorsa, T., ... & Ortiz, F. (2019). Oral symptoms and oral health-related quality of life in patients with chronic kidney disease from predialysis to posttransplantation. *Clinical Oral Investigations*, 23(5), 2207-2213. DOI: 10.1007/S00784-018-2647-Z

Fregoneze, A. P., Oliveira Lira Ortega, A., Brancher, J. A., Vargas, E. T., Braga, I. K., Gemelli, S., ... & Ignácio, S. A. (2015). Clinical evaluation of dental treatment needs in chronic renal insufficiency patients. *Special Care Dentistry*, 35(2), 63-67. DOI: 10.1111/SCD.12094

Oyetola, E. O., Owotade, F. J., Agbelusi, G. A., Fatusi, O. A., & Sanusi, A. A. (2015). Oral findings in chronic kidney disease: implications for management in developing countries. *BMC Oral Health*, 15, 24. DOI: 10.1186/S12903-015-0004-Z

Ausavarungnirun, R., Wisetsin, S., Rongkiettechakorn, N., Chaichalermsak, S., Udompol, U., & Rattanasompattikul, M. (2016). Association of dental and periodontal disease with chronic kidney disease in patients of a single, tertiary care centre in Thailand. *BMJ Open*, 6(7), e011836. DOI: 10.1136/BMJOPEN-2016-011836

Laheij, A., Rooijers, W., Bidar, L., Haidari, L., Neradova, A., de Vries, R., & Rozema, F. (2022). Oral health in patients with end-stage renal disease: A scoping review. *Clinical and Experimental Dental Research*, 8(1), 54-67. DOI: 10.1002/CRE2.479

College of Dental Hygienists of Ontario. (2016). CDHO Chronic Kidney Disease Fact Sheet. *Refseek*, 1-7. Read Fact Sheet

Andaloro, C., Sessa, C., Bua, N., & Mantia, I. (2018). Chronic kidney disease in children: Assessment of oral health status. *Dentistry and Medical Problems*, 55(1), 23-28. DOI: 10.17219/DMP/81747

Hernandez, C. (2016). Oral disorders in patients with chronic renal failure: Narrative review. *Journal of Oral Research*, 5(1), 27-34. Read Article

Nazish, K., Shairose, A., Kwiatowski, M., et al. (2018). Oral manifestations and dental management of patients with chronic renal failure on hemodialysis. *Journal of the Pakistan Dental Association*. Read Article

Marinoski, J., Bokor-Bratic, M., Mitic, I., & Cankovic, M. (2019). Oral mucosa and salivary findings in non-diabetic patients with chronic kidney disease. *Archives of Oral Biology*, 102, 205-211. DOI: 10.1016/j.archoralbio.2019.04.021

Kesmez, O., Frojk, M., & Eidamak, I. (2020). Oral symptoms and pathologies in Danish patients with chronic kidney disease: A pilot study. *Journal of Pathology, Microbiology, and Immunology*. Read Article

Kuravatti, S., et al. (2016). Oral manifestations of chronic kidney disease: An overview. *International Journal of Contemporary Medical Research*. Read Article

Martinez, C. (2020). Base protocol for dental management of patients with chronic renal failure (CRF). [Thesis]. University of Santiago de Cali, Faculty of Health, Dentistry Program. Read Thesis

Carriel, O. (2020). Oral health in patients with renal insufficiency. [Thesis]. University of Guayaquil, Faculty of Dentistry. Read Thesis

Ruas, B., et al. (2020). Integralidade do cuidado para pacientes brasileiros em hemodiálise: Análise do acesso odontológico. *Ciência & Saúde Coletiva*, 25(2), 533-540. DOI: 10.1590/1413-81232020252.06362018

Verdezoto, G. (2020). Oral manifestations in patients with chronic renal insufficiency. [Thesis]. University of Guayaquil, Faculty of Dentistry. Read Thesis

Naranjo, V. (2016). Oral lesions in patients with renal failure undergoing dialysis treatment at the IESS hospital in the city of Ambato province of Tungurahua from January - December 2015. [Thesis]. Regional Autonomous University of the Andes.

Sulejmanagić, H., Sulejmanagić, N., Prohić, S., Secić, S., & Miseljić, S. (2005). Dental treatment of patients with kidney diseases: Review. *Bosnian Journal of Basic Medical Sciences*, 5(1), 52-56. DOI: 10.17305/BJBMS.2005.3335

Cerveró, A. Jover, et al. (2008). Dental management in renal failure: Patients on dialysis. *Medicina Oral, Patología Oral y Cirugía Bucal*, 13(7), E419-26.

Arias, E. J., Ruiz, D. V. P., & Zambrano, L. O. A. (2021). Technological solution to improve security in the transport of products through electronic devices. *University and Society*, 13(S1), 165–171. Read Article

Arias, I. F. B., Manzo, A. D. M., & Piza, I. A. C. (2021). The assessment of environmental pollution at the cantonal level. *University and Society*, 13(S1), 172–179. Read Article

Ayala, J. M. B., Cando, J. L. M., & Arevalo, D. F. M. (2021). Analysis of the consequences of immigration in the canton of Santo Domingo, Ecuador. *University and Society*, 13(S1), 180–188. Read Article

Basurto, F. B. A., Robalino, E. A. C., & Zúniga, C. P. C. (2021). Conceptual mapping for the understanding of the role of motivation in the appeal. *University and Society*, 13(S1), 189–197. Read Article

Cardenas, J. A. R., Riofrio, C. A. M., & Armijo, J. G. S. (2021). Abandonment in childhood and adolescence, determining factors in the effectiveness of administrative and judicial processes. *University and Society*, 13(S1), 198–208. Read Article

Ruiz, M. R. H., Martínez, R. C. J., & Ortiz, B. E. T. (2021). Application of the Pest-SWOT methods for the diagnosis of the current situation of indigenous justice in Ecuador. *University and Society*, 13(S1), 209–218. Read Article