

# PREVENTIVE PROGRAM BASED ON MULTIPLE INTELLIGENCES TO PROMOTE ORAL HEALTH IN DISABLED CHILDREN FROM CHICLAYO, PERU

Programa preventivo basado en inteligencias múltiples para promover la salud bucal en niños discapacitados de Chiclayo, Perú

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## ABSTRACT

**Introduction:** Children with physical disabilities often present deficient oral hygiene and eating habits that threaten optimal oral health. **Objective:** To evaluate the result of a preventive program based on multiple intelligences to promote oral health care in children with physical disabilities in Chiclayo - Peru.

**Materials and Methods:** A quasi-experimental, quantitative, prospective and longitudinal study was carried out from the year 2020, to test a preventive intervention based on multiple intelligences (MI), comparing it with an intervention with traditional methodology, whose purpose was in both cases promote preventive oral health care in 167 boys and girls with physical disabilities from four Special Basic Education Centers (CEBES) in Chiclayo. For the pre- and post-test evaluation using a dental record of oral hygiene practices, oral hygiene index and dietary exposure to sugary carbohydrates, the Mann Whitney U test was required, with a confidence level of 95%.

**Results:** After not very encouraging findings in the pretest for both groups, significant changes were observed in the posttest in favor of the IM-based program, for which 58% of schoolchildren registered an adequate oral hygiene index, 69.2% brushed twice to three times a day and that only 35.8% present regular exposure to carbohydrates. Statistical significance was evidenced in favor of the MI-based intervention for the three indicated variables ( $p= 0.000$ ).

**Conclusions:** The application of the IM-based program achieved better results in the significant promotion of oral hygiene practices with a favorable record of the IHO and by reducing the exposure to carbohydrates in a vulnerable population.

**Keywords:** *Health promotion; Oral health; Preventive dentistry; Health education; Children with disabilities.*

## RESUMEN

**Objetivo:** Describir las características de las tesis de licenciatura, satisfacción y motivos para la elección de un tema de estudio.

**Materiales y Métodos:** Estudio transversal que incluyó a dos poblaciones, las tesis y a los tesisas que lograron sustentar sus trabajos desde el año 2015 al 2021 en la Facultad de Odontología de la Universidad Nacional Mayor de San Marcos (Lima, Perú). Se utilizó el análisis documental en un primer momento para registrar datos bibliométricos. La encuesta se utilizó en un segundo momento para recabar información relacionada a los motivos por los cuales escogieron su tema los tesisas y el grado de satisfacción.

**Resultados:** Se examinaron 269 tesis. La mayoría de ellas fueron realizadas por mujeres ( $n=142$ ; 52,8%). Todas tuvieron un enfoque cuantitativo. El diseño transversal/descriptivo fue el más frecuente ( $n=207$ ; 77%). De los 114 encuestados, la mayoría de ellos indicó que la decisión de su tema de tesis fue influida por un docente ajeno a su asesor ( $n= 26$ ; 22,8%). El 49,1% de tesisas estuvo totalmente de acuerdo respecto a lo aprendido sobre investigación al culminar su tesis.

**Conclusión:** Las tesis de licenciatura evidenciaron ser desarrolladas principalmente por mujeres, la mayoría estuvo satisfecho con la elaboración y ejecución de su trabajo académico; se evidenció que los temas de tesis son influenciados principalmente por un docente diferente al asesor de tesis, esto indica que los asesores deben ser más conscientes al momento de guiar al estudiante e influir en las decisiones temáticas, metodológicas y de redacción junto con el asesorado.

**Palabras Clave:** *Estudiantes de Odontología; Motivación; Tesis académicas; Satisfacción.*

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## INTRODUCTION

Poor oral health conditions in Peru are considered a public health problem. They are one of the 12 main health challenges that must be urgently addressed.<sup>1</sup> The average of the DMFT index (decayed, missing, and filled permanent teeth) reported in children 6 to 12 years old over the last five decades is of special concern.<sup>2,3</sup>

In this context, poor oral health status in children with physical disabilities, generally characterized by poor hygiene practices and an inadequate diet, significantly increase the probability of having a high risk of developing dental caries.<sup>4,5</sup> In this regard, although it is true that preventive programs have been implemented, they have still been insufficient in coverage and effectiveness,<sup>5</sup> because the traditional methodologies based on intellectual intelligence and memorization have apparently been unsuccessful in promoting healthy behaviors to reach optimal health in general and oral health in particular.<sup>4,6</sup>

With this concern in mind, in 2015, authors such as Barturén *et al.*,<sup>4</sup> implemented a program based on multiple intelligences (MI) as a way of effectively promoting oral hygiene practices. They achieved favorable results after an intervention in 87 primary school children from the city of Chiclayo. In that same year, Aguirre *et al.*,<sup>5</sup> used educational intervention strategies that included collective games to promote oral hygiene in 50 patients, from 6 years of age, with Down Syndrome; as a result, 92% of them started to brush their teeth three times a day. In another study conducted in

2021, Chumpitaz *et al.*,<sup>7</sup> obtained favorable cost-effectiveness results by implementing an educational intervention based on MI, geared towards the promotion of exclusive breastfeeding. As a result, 68.27% of the participating mothers breastfed for six or more months. This had a positive impact on the health of their children.

It is the particularly low number of interventions based on alternative methodologies that leads towards the models based on cognitivism and MI, which provide greater learning opportunities for children with special needs.<sup>4</sup> Specifically, the theory proposed by Howard Gardner offers the opportunity to adapt it and use it in educational sessions in different fields of learning, such as the promotion of better health conditions and quality of life.<sup>8,9</sup>

In this path of breaking the classic schemes of preventive programs based on traditional educational approaches that rely only on intellectual intelligence and memory,<sup>4</sup> it is sensible to look at the different types of intelligence, that is, linguistic, logical-mathematical, musical, spatial, intrapersonal, interpersonal, and naturalistic. They could provide greater learning opportunities aimed at promoting preventive behaviors.<sup>4,7</sup>

In addition, by engaging in an innovative experience with differently-abled children, researchers expect to achieve a positive social impact, since these initiatives seek the integration of the family, educators, health professionals, and other social actors in helping children with physical disabilities.<sup>8,9</sup> The use of innovative and flexible

educational sessions adapted to children with disabilities allows for the assessment of their oral health status, by adopting preventive hygiene practices and healthy eating behaviors involving their parents and educators. The latter act as health promoters who can continue and reinforce the learning experiences after the intervention.<sup>4,7</sup>

Consistent with what was previously indicated, the aim of this study is to evaluate the results of a preventive program based on multiple intelligences to promote oral health care in children with physical disabilities in the city of Chiclayo, Perú.

## MATERIALS AND METHODS

A quasi-experimental, quantitative, prospective, and longitudinal study was carried out to evaluate an educational intervention based on MI and compare it with an intervention based on a traditional methodology. The purpose in both cases was to promote preventive oral health care in children with physical disabilities. For this purpose, there were pre- and post-test evaluations corresponding to oral hygiene practices, measurements of the oral hygiene index and dietary exposure to sugary carbohydrates. The pre-test was carried out between April and July 2020, and the follow-up evaluation was made between June and August 2021.

The study population consisted of 167 boys and girls with physical disabilities from four Special Primary Education Centers (CEBES, for its acronym in Spanish) in the city Chiclayo in Lambayeque, Peru.

As it was possible to work with the entire study population, the selection of participants corresponded to a census sample. The participants were randomly assigned to the study groups, resulting in 45 participants from CEBES "La Victoria" and 41 from CEBES "Pimentel", who were part of the control group, in addition to 39 participants from CEBES "Cayalti" and 42 from CEBES "Chiclayo" that were part of the experimental group receiving the MI intervention.

Inclusion criteria included those participants whose parents gave their informed consent and who permanently accompanied their children during the implementation of the educational and evaluation sessions. It also included those who had permanent access to virtual or online educational sessions. Children whose health conditions prevented their active participation and those who attended sessions very irregularly were excluded from the study. Regarding the development of educational programs, a comparative table is presented below (Table 1) with the main scope of both programs:

The traditional methodology is the one that has predominantly been applied in various preventive oral health programs. As already mentioned, the MI methodology is based on Howard Gardner's Theory. He proposed that human intelligence is not limited to their intellectual capacity, but to a set of skills and competencies organized into eight types of intelligence.<sup>10,11</sup> Table 2 shows the activities that were carried out within the framework of this methodology.

Data collection regarding oral hygiene practices, recording of the oral hygiene index and dietary exposure to sugary carbohydrates, required the use of a conventional diagnostic record in Dentistry, used for clinical and research purposes at the Dental Clinic of the School of Dentistry at Universidad San Martín de Porres.

In this way, the oral hygiene index was obtained according to the Silness and Loe model. This model was used to determine and record the presence of bacterial plaque in a sample of six teeth. Values were "zero" when there was no plaque, "one" when soft plaque was found covering no more than one third of the tooth surface, "two" when soft plaque covered more than one third but less than one third of the exposed tooth surface, and "three" when soft plaque covered more than one third of the tooth surface. Once the values of the six indicated surfaces were recorded, the mean value was obtained. If it was between 0.0 and 0.6 it was considered adequate, between 0.7 and 1.8 it was considered acceptable, but if it was between 1.9 and 3.0 it was deemed deficient.

Oral hygiene practices were determined with values from zero to three, corresponding to "zero" practices per day, "one", "two" or "three" practices per day. Regarding dietary exposure to carbohydrates, it was recorded as "zero" when there was no consumption of carbohydrates in the last five days prior to the evaluation, "one" when the consumption was infrequent up to two exposures per day, "two" when consumption was regular, that is, up to three exposures per day, "three"

when consumption was frequent, up to four exposures per day, and "four" when consumption was very frequent, that is, more than four exposures per day.

During the study, extreme care was taken to control possible biases, making sure that the results obtained were due exclusively to the implementation of the educational intervention. In addition, the methodology is replicable since it is viable to implement similar interventions in different populations of children with special abilities.

For the processing and analysis of data, a database was created in the software SPSS version 22. The Kolmogorov Smirnov test was used to demonstrate compliance with the assumption of normality of the data distribution. The Wilcoxon test was then applied and later the Mann Whitney U test was used to compare both groups. A significance level of 0.05 with a confidence level of 95% were considered.

The present research complied with the bioethical principles of the Declaration of Helsinki and Vancouver. It was also approved by the Bioethics Commission and the Research Unit of Universidad San Martín de Porres, under Rector's Resolution No. 518 - 2017 - CU - R - USMP and Directorial Resolution No. 769-2020-D- FO-USMP. The absolute physical, emotional, and social integrity of the participating children was protected by limiting the intervention to the application of educational programs under permanent supervision of parents and educators.

**Table 1:** Comparison of educational programs: one with a traditional approach and the other with a MI-based approach to promote oral health care.

<b>Comparison criteria</b>	<b>Traditional Educational Program</b>	<b>Program Based on Multiple Intelligences</b>
Place of implementation	CEBES “La Victoria” and CEBES “Pimentel”.	CEBES “Cayalti” and CEBES “Chiclayo”.
Target population	86 boys and girls between 6 and 9 years of age with physical disabilities.	81 boys and girls between 6 and 9 years old with physical disabilities.
Content of the interventions	Importance of oral health. Components of the oral cavity. Functions of the oral cavity. Preventive care for good oral health. Importance of oral hygiene. Plaque control. Brushing techniques and effective use of dental floss. Healthy nutrition.	
Educational materials	Brochures, flipcharts, videos, posters, models, blackboard and markers, passive and static methods.	Recyclable materials that facilitated active participation including collective, playful, didactic, and practical activities.
Methodology	The active role was played by the facilitators by means of educational and demonstrative sessions such as talks in which the participants listened, observed, and repeated the messages. Formulation of questions to verify that the participants could repeat and memorize the messages of the educational sessions.	Use of more generic educational, visual, and auditory material, to encourage individual responses. The active role was played by the participants themselves by means of dynamic and practical educational sessions in which the children participated actively and interacted with each other. Formulation of questions to retrieve previous knowledge and to verify that they have found their own meaning to the messages. Use of dynamic, personalized, playful, and didactic material to promote group interactions and individual involvement.
Investment cost	US\$ 765	US\$ 647
Length of each educational intervention	12 sessions (between April and July 2020) with follow-up evaluation (between June and August 2021).	
Hours per session	Between 2 and 3 hours for each session	
Evaluation, control, and monitoring	Baseline evaluation (pre-test), immediate evaluation and follow-up evaluation (post-test).	

**Table 2:** Activities that were carried out in the educational intervention based on multiple intelligences.

Multiple intelligences	Activities
Verbal-linguistic intelligence	Stories, riddles, acrostics, and sayings were created, related to oral hygiene practices and healthy eating. Oral interventions, debates, exchange of opinions, presentations, and questions were also elicited and encouraged to verify the participants' progress.
Musical intelligence	The lyrics of well-known songs were changed, adapting them to the promotion of oral health care, healthy eating, and regular visits to the dentist. In addition, an artistic musical show involving educational activities, including songs and dances for the promotion of oral health care, was organized, and later carried out.
Logical–mathematical intelligence	Children were asked to participate in practical exercises that led to the measurement of the time and frequency of brushing, in addition to making a list of healthy foods that they classified according to their nutritional content, serving size, cost, and availability in stores. They were also asked to make possible appointments with the dentist.
Bodily–kinesthetic intelligence	Simulations were carried out with the technique and logical sequence of brushing, which were controlled and supervised by the dentists. Children also learned how to identify appropriate places and services where they could perform oral hygiene practices. Participants also engaged in simple gymnastics activities, tai chi, and body position games related to oral health.
Intrapersonal intelligence	Reflection regarding the importance of evaluating their oral health was encouraged. Participants analyzed how they would feel if they had any pain in their mouth, as well as everything they can do with a healthy mouth. They commented how they feel every time they go to their dental check-up. They learned how to value good oral health, aesthetics, and being free of bad breath and caries.
Interpersonal intelligence	Participants helped each other to improve their brushing technique. They formed groups to resolve situations, presented by the educator, related to their health care during the day. Through games and different activities, they learned the value of teamwork and recognized the importance of family participation to achieve healthy behaviors.
Spatial–visual intelligence	Healthy and unhealthy foods (sweets) were compared. They verified and wrote down the type of food they find in the stores in their community. They identified spaces to carry out physical activities as part of their healthy lifestyles.
Naturalistic intelligence	Activities that promoted and fostered safe and healthy environments for oral health care were carried out. They discussed the importance of consuming natural foods (water, proteins, fruits, and vegetables) instead of synthetic and processed foods. They valued the importance of caring for spaces free of contamination and the preservation of clean water.

**Table 3:** Normality tests of the processed data.

Variable	p-value*
OHI control group (before)	0.000
OHI control group (after)	0.000
Brushing per day control group (before)	0.000
Brushing per day control group (after)	0.000
Exposure to carbohydrates control group (before)	0.000
Exposure to carbohydrates control group (after)	0.000
OHI intervention group (before)	0.002
OHI intervention group (after)	0.000
Brushing per day intervention group (before)	0.000
Brushing per day intervention group (after)	0.000
Exposure to carbohydrates intervention group (before)	0.000
Exposure to carbohydrates intervention group (after)	0.000

Source: CEBES Chiclayo, database of schoolchildren with physical disabilities. 2020-2021.

**Table 4:** Distribution of the oral hygiene index, before and after in the control and MI groups.

Control group	Before		After	
	Frequency	Percentage	Frequency	Percentage
Adequate	11	12.8	7	8.1
Acceptable	35	40.7	46	53.5
Deficient	40	46.5	33	38.4
<b>Total</b>	<b>86</b>	<b>100</b>	<b>81</b>	<b>100</b>
Group with MI				
Adequate	10	12.3	28	34.6
Acceptable	36	44.4	47	58
Deficient	35	43.2	6	7.4
<b>Total</b>	<b>81</b>	<b>100</b>	<b>81</b>	<b>100</b>

Source: CEBES Chiclayo, database of schoolchildren with physical disabilities

**Table 5:** Distribution of brushing frequency per day, before and after in the control and MI groups.

		Before		After	
		Frequency	Percentage	Frequency	Percentage
<b>Control group</b>	0 per day	55	64	44	51.2
	1 per day	17	19.8	13	15.1
	2 per day	10	11.6	17	19.8
	3 per day	4	4.7	12	14
	<b>Total</b>	<b>86</b>	<b>100</b>	<b>86</b>	<b>100</b>
<b>Group with MI</b>	0 per day	57	70.4	6	7.4
	1 per day	11	13.6	19	23.5
	2 per day	10	12.3	31	38.3
	3 per day	3	3.7	25	30.9
	<b>Total</b>	<b>81</b>	<b>100</b>	<b>81</b>	<b>100</b>

Source: CEBES Chiclayo, database of schoolchildren with physical disabilities.

**Table 6:** Distribution of carbohydrate exposure, before and after in the control and MI groups.

Carbohydrate Exposure		Before		After	
		Frequency	Percentage	Frequency	Percentage
<b>Grupo Control</b>	1 = Infrequent	0	0	0	0
	2 = Regular/Acceptable	6	7	5	5.8
	3 = Frequent	65	75.6	75	87.2
	4 = Very frequent	15	17.4	6	7
	<b>Total</b>	<b>86</b>	<b>100</b>	<b>86</b>	<b>100</b>
<b>Grupo con IM</b>	1 = Infrequent	0	0	0	0
	2 = Regular/Acceptable	6	7.4	29	35.8
	3 = Frequent	67	82.7	51	63
	4 = Very frequent	8	9.9	1	1.2
	<b>Total</b>	<b>81</b>	<b>100</b>	<b>81</b>	<b>100</b>

Source: CEBES Chiclayo, database of schoolchildren with physical disabilities.

Ranges: 1 = Infrequent means up to two exposures per day; 2 = Regular/acceptable means up to three exposures per day; 3 = Frequent means up to four exposures per day; 4 = Very frequent means more than four exposures per day.

**Table 7:** Estimation of statistical significance of the variables: oral hygiene index, brushing, and exposure to carbohydrates in the control group and in the group with MI, before and after the intervention.

Variable	Time of measurement	Group	Mean	Median	SD	N	p-value*
Index of oral hygiene	PRE-TEST	Control	1.52	1.66	0.73	86	0.717
		With MI	1.48	1.66	0.73	81	
	POST-TEST	Control	1.47	1.66	0.62	86	0.000
		With MI	0.89	0.83	0.52	81	
Brushing frequency	PRE-TEST	Control	0.57	0	0.88	86	0.453
		With MI	0.49	0	0.85	81	
	POST-TEST	Control	0.97	0	1.13	86	0.000
		With MI	1.93	2	0.92	81	
Carbohydrate exposure	PRE-TEST	Control	3.10	3	0.49	86	0.245
		With MI	3.02	3	0.42	81	
	POST-TEST	Control	3.01	3	0.36	86	0.000
		With MI	2.65	3	0.50	81	

Source: CEBES Chiclayo, database of schoolchildren with physical disabilities. 2020-2021.

Value of (p = 0.000<0.05)



## RESULTS

According to the data processing of the variables corresponding to the oral hygiene index, frequency of brushing, and exposure to carbohydrates, the Kolmogorov Smirnov normality test specified that the processed data did not present a normal distribution in any case. (Table 3)

Among the main findings of this study, the values corresponding to the Oral Hygiene Index (OHI) found before the educational interventions were similar in both the control and intervention groups, having observed a deficient OHI ranging from 46.2% to 43.2%, an acceptable OHI between 40.7% and 44.4%, and an adequate OHI between 12.3% and 12.8%. After the educational interventions, no significant improvements were found in the control group, presenting an adequate OHI of 8.1%, 53.5% with an acceptable OHI, and 38.4% with a deficient OHI. On the contrary, there were significant improvements in the intervention group with MI, by getting 34.6% of the children to reach an adequate OHI; 58% an acceptable OHI, and only 7.4% a deficient OHI. (Table 4)

Regarding brushing frequency, very similar results were also observed in both groups before the educational interventions: for example, between 64% and 70.4% of both groups did not practice brushing, between 13.6% and 19.8% brushed once a day, between 11.6% and 12.3% brushed twice a day, and only between 3.7% and 4.7% brushed three times a day. After the educational interventions, there were significant improvements in the experimental

group: 23.5% performed it once a day, 38.3% twice a day, 30.9% did it three times a day, and only 7.4% showed no brushing frequency. In comparison, a worrying 51.2% of the participants in the control group continued without brushing, while 15.1%, 19.8%, and 14% performed it once, twice and three times a day, respectively. (Table 5)

Regarding exposure to carbohydrates, similarities were again found in both groups before the intervention, for example, between 7% and 7.4% of the children reported regular exposure to carbohydrates, between 75.6% and 82.7% reported frequent exposure, and between 9.9% and 17.4% showed very frequent exposure. On the contrary, the experimental group in the post-test improved significantly: 35.8% of the children reported regular or acceptable exposure to carbohydrates, 63% frequent exposure, and only 1.2% showed very frequent exposure; compared to the control group in which 5.8%, 87.2%, and 7% presented regular, frequent, and very frequent exposure, respectively. (Table 6)

It can be concluded that based on the value of ( $p = 0.000 < 0.05$ ) obtained with the Mann Whitney U test in the post-test for the variables oral hygiene index, frequency of brushing, and exposure to carbohydrates, statistical significance is evidenced with a difference in favor of the experimental intervention (MI) compared to the control group. (Table 7)

## DISCUSSION

The high prevalence of dental caries reported in Latin American countries is a cause of serious concern. In this regard, studies carried out by Martins *et al.*,<sup>12</sup> and Paiva *et al.*,<sup>13</sup> have shown a mean of 5.84 decayed, missing, and filled teeth in the Peruvian infant population, coinciding with Villena<sup>3</sup> and Manrique,<sup>14</sup> who consider the issue of dental caries as a public health problem. In this context, in studies carried out by Chumpitaz *et al.*,<sup>6</sup> on 237 schoolchildren between 6 and 7 years old of the city of Chiclayo, a poor oral hygiene index of 2.04 was obtained in 2017.

In another study conducted in the same year, Córdova *et al.*,<sup>15</sup> reported a caries prevalence of 87.2% in a study conducted on 109 schoolchildren. It is necessary to clarify that these last two studies included children with physical disabilities.

The infant population with physical disabilities, who are apparently participating in educational programs that promote oral health care organized by the Ministry of Health,<sup>16</sup> deserves even greater efforts from the government and society. A concern also shared by Contreras,<sup>17</sup> who highlights the scope of the promotion of oral health as an effective strategy, but which has also been considered insufficient and far from having a positive impact on the infant population, especially children with special needs. In this regard, Gutiérrez<sup>18</sup> emphasizes the need to invest in health programs and interventions within the framework of the budget allocated to health programs, so that they may become significant contributions

for vulnerable populations. In this sense, Gispert *et al.*,<sup>19</sup> analyze how the optimization of resources can produce encouraging results, as has happened in preventive interventions carried out in primary school students in Cuba and Venezuela.

Getting involved in the development of preventive programs that benefit children with physical disabilities, considering their characteristics, interests, and abilities, is a concern shared by authors such as López *et al.*,<sup>20</sup> and Zambrano.<sup>21</sup> They point out that these initiatives should not only respond to their educational and health needs, but should be aimed at ensuring an optimal quality of life. Venturiello *et al.*,<sup>22</sup> statements are of real importance when assessing rehabilitation programs as a relevant action to rediscover new opportunities to have a healthy life, with motivation to continue with their learning processes, within a framework that reinforces healthy behaviors.

Having achieved significant results in favor of a preventive intervention based on MI, with 58% of participants reaching an adequate oral hygiene index (OHI), 69.2% with a brushing frequency of two to three times a day, and 35.8% of children with regular exposure to carbohydrates, is only comparable to the study carried out by Barturén *et al.*,<sup>4</sup> who, by applying the same methodology based on MI, achieved that 36.9% of primary school children in Chiclayo reached an adequate OHI and that 41.5% improved their oral hygiene practices. In other preventive interventions based on alternative methodologies, Ghezzi *et al.*,<sup>23</sup> applied a didactic educational program

in 2015, the results of which showed that 78.8% of students from a primary school in Lima increased their knowledge regarding oral hygiene and healthy eating.

Two years ago, González *et al.*,<sup>24</sup> had previously verified the effectiveness of a program with a demonstrative, participatory, and didactic methodology, by getting 224 boys and girls from a primary school in Lima to achieve a moderate OHI of 1.08. On their part, after a review of preventive interventions, Espinoza *et al.*,<sup>25</sup> suggest that for the programs to be effective and innovative, considering that they are aimed at schoolchildren with different levels of learning, they must include creative and participatory activities as their main strength.

Consequently, Chumpitaz *et al.*,<sup>6</sup> highlight the importance of considering new interventions based on the four levels of prevention, from their immediate results to their long-term contribution, so that it is possible to estimate their real impact on children with disabilities. In this sense, Gispert *et al.*,<sup>19</sup> agree on the need to evaluate the cost-effectiveness relationship of community preventive programs to guarantee the benefits for the infant population, especially schoolchildren with physical limitations, who are highly vulnerable.

In other preventive experiences such as the one carried out by Díaz-Garavito *et al.*,<sup>26</sup> in a vulnerable population of 479 schoolchildren in the city of Medellín, Colombia, with a prevalence of dental caries of 57.54% in 2015 and 28.33% in 2017, the need to implement long-term impact preventive interventions was justified. Cruz-Martínez

*et al.*,<sup>27</sup> after implementing a preventive program in Mexican primary schools involving highly vulnerable boys and girls, managed to keep the initial DMFT index of 1.34 below the standard average of 1.86 found in groups without preventive intervention.

On the other hand, Cardozo *et al.*,<sup>28</sup> after applying an oral health education program in the city of Corrientes, Argentina, managed to get 114 high-risk and vulnerable children to increase their brushing practices and significantly reduce their consumption of sugary foods.

As Cisneros *et al.*,<sup>29</sup> point out oral health education at an early age provides valuable opportunities to have better well-being and life conditions. However, the added value of a methodology based on multiple intelligences undoubtedly contributes with better tools and greater opportunities to enhance the learning processes, not only in children but also in adults. With this idea, in 2021, authors such as Chumpitaz *et al.*,<sup>7</sup> applied it as a valid educational methodology to promote exclusive breastfeeding in a mothers' club in Chiclayo. In other studies, authors, such as Athanassopoulos-Zamorano *et al.*,<sup>30</sup> see this approach as an effective alternative to traditional methodologies to provide better opportunities for improving well-being at different stages of life.

Meanwhile, Asqui *et al.*,<sup>30</sup> visualize its implications in physical education, which makes researchers think about getting involved in new interventions aimed at stimulating not only cognitive skills but also the set of physical and social capabilities of people with disabilities regardless of gender and age. The main contribution of this research is

to provide a better alternative to people with physical disabilities, by achieving a better oral health status through participatory and meaningful educational sessions, offering greater opportunities to the educational system to contribute to adopting healthy behaviors for the benefit of vulnerable and some-time neglected populations. In addition, by socializing its scope with the incumbent authorities, preventive health education policies can be promoted, with the aim of filling a gap as only few methodological interventions have been identified.

It should be noted that the results of this study are attributed exclusively to the intervention methodology and not to other factors or the interference of possible biases. The latter were ruled out as the present study was based on a process of exclusive participation and only in the context of educational programs.

## CONCLUSION

The undergraduate theses were carried on mostly by women, most of the theses' authors were satisfied with the prepara-ti

## CONFLICT OF INTERESTS

None declared by the authors, who state that they are free of private interests of any kind.

## ETHICS APPROVAL

Study was approved by the Bioethics Commission and the Research Unit of Universidad San Martín de Porres, under Rector's Resolution No. 518 - 2017 - CU - R - USMP and Directorial Resolution No. 769-2020-D- FO-USMP.

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## AUTHORS' CONTRIBUTIONS

**Chumpitaz-Durand R:** Conceptualized, designed the methodology, participated in the administration of the research, in writing and editing.

**Vidal-Mosquera A, Lecca-González M:** Contributed to the design of the publication and the acquisition of data. As well as in data processing and critical review of the final version.


**Córdova-Sotomayor D:** Contributed to the discussion, to the final draft of the publication, and to the interpretation of the results. The four authors assume responsibility for the article.

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