

3D-Printed versus Laboratory-Fabricated Hyrax Expanders: A Randomized Controlled Clinical Trial

2022 Orthodontic Faculty Development Fellowships (OFDFA)

Dr. Ildeu Andrade Jr

ildeu.andrade@pitt.edu
O: 843-819-7996

FollowUp Form

Award Information

In an attempt to make things a little easier for the reviewer who will read this report, please consider these two questions before this is sent for review:

- Is this an example of your very best work, in that it provides sufficient explanation and justification, and is something otherwise worthy of publication? (We do publish the Final Report on our website, so this does need to be complete and polished.)*
- Does this Final Report provide the level of detail, etc. that you would expect, if you were the reviewer?*

Title of Project*

3D-Printed versus Laboratory-Fabricated Hyrax Expanders: A Randomized Controlled Clinical Trial

Award Type

Orthodontic Faculty Development Fellowship Award (OFDFA)

Period of AAOF Support

July 1, 2022 through June 30, 2024

Institution

University of Pittsburgh-Of the Commonwealth System of Higher Education

Names of principal advisor(s) / mentor(s), co-investigator(s) and consultant(s)

Timothy Tremont, Sarandeep Huja, Wellington Rody and Julie Marshall

Amount of Funding

\$20,000.00

Abstract

(add specific directions for each type here)

The objective of this proposal is to provide Dr. Andrade with the opportunity to strengthen his teaching, research and clinical skills as a full-time faculty member in the Department of Orthodontics, James B. Edwards College of Dental Medicine at the Medical University of South Carolina (MUSC). Dr. Andrade is serving as the Program Director of the Orthodontic Residency Program at MUSC and is also engaging in

teaching pre-doctoral students. He will be supervising the orthodontic residency clinic three half-days a week, dedicating three half-days to research activities, a half-day for teaching and a half-day a week to administrative duties at MUSC. He will also be providing patient care in the faculty practice two half-days a week. His goals for the 2022-2023 academic year are to take courses in academic leadership, clinical trials' design and interpretation, statistical techniques for clinical trials, and also 3D orthodontics (Invisalign and in-house aligners).

The Orthodontic Faculty Development Fellowship Award (OFDFA) from the American Association of Orthodontists Foundation will greatly support his development in education, teaching and research. Dr. Timothy Tremont, Professor and the Chair of the Department of Orthodontics; Dr. Sarandeep Huja, Professor and Dean of the James B. Edwards College of Dental Medicine at the Medical University of South Carolina; and Dr. Wellington Rody, Associate Professor and Chair of the Department of Orthodontics and Pediatric Dentistry at State University of New York at Stony Brook, will mentor him. Dr. Andrade has developed the following organized plan of education, research, teaching, and clinical practice to help him to establish himself as a valuable educator and researcher at the MUSC.

Respond to the following questions:

Detailed results and inferences:*

If the work has been published, please attach a pdf of manuscript below by clicking "Upload a file".

OR

Use the text box below to describe in detail the results of your study. The intent is to share the knowledge you have generated with the AAOF and orthodontic community specifically and other who may benefit from your study. Table, Figures, Statistical Analysis, and interpretation of results should also be attached by clicking "Upload a file".

Figures and Tables.pdf

The preliminary results presented below are based on the statistical analysis of data from 22 subjects. The randomized clinical trial (RCT) supported by this grant is still ongoing. To date, 32 patients have been enrolled, and an additional 10 are needed to reach the planned sample size (n = 42).

These partial findings have contributed to two master's theses completed in the Department of Orthodontics at the Medical University of South Carolina.

Results:

Participant flow

Fifty patients were assessed for eligibility for this study. Three patients declined to participate. Six patients did not begin orthodontic treatment. Twenty-three patients met the inclusion criteria and were enrolled in the clinical trial. One patient did not follow the protocol and was excluded from the study. The CONSORT Guidelines flow diagram is presented in Figure 1.

Baseline data

Of the 22 subjects included in the study and analyzed, 12 (55%) were randomly assigned and treated using the CLH expander and 10 (45%) using the 3DH expander. Of the patients assigned to CLH expander, 9 were female and 3 were male. Of the patients assigned to 3DH expander, 4 were female and 6 were male. The average age of the CLH group was 11.5 years, and the average age of the 3DH group was 10.7 years. Of the patients assigned to CLH expander, 6 were in the 8-10 age group and 6 were in the 11-13 age group. Of the patients assigned to 3DH expander, 3 were in the 8-10 age group and 7 were in the 11-13 age group (Table I).

Primary outcome analyses

Intraexaminer reliability was calculated and found to be very high (ICC average 0.978). The means, standard deviations (SD), and comparisons between T0 and T1 for the CLH expander are shown in Table II. For the CLH expander, there were significant increases in all variables measured. The means, SD, and

comparisons between T0 and T1 for the 3DH expander are shown in Table III. For the 3DH expander, there were significant increases in all measurements except intercanine width, right molar inclination, and left molar inclination. The means, SD, and comparisons of the changes (T1-T0) between the expander groups are shown in Table IV. The mean anterior midpalatal suture opening (ASO) was 2.56 +/- 0.84mm for CLH and 2.89 +/- 1.54mm for 3DH. The mean interincisal diastema width change (DWC) was 2.19 +/- 1.08mm for CLH and 2.17 +/- 1.38mm for 3DH. The mean intercanine width change (ICWC) was 2.9 +/- 1.03mm for CLH and 2.73 +/- 1.43mm for 3DH. The mean interpremolar or inter-first-deciduous-molar width change (IPWC) was 4.47 +/- 0.95mm for CLH and 4.28 +/- 1.66mm for 3DH. The mean intermolar width change (IMWC) was 4.97 +/- 0.91mm for CLH and 4.65 +/- 1.11mm for 3DH. The mean right molar inclination change (RMIC) was 6.03 +/- 2.56degrees for CLH and 5.77 +/- 3.43 degrees for 3DH. The mean left molar inclination change (LMIC) was 6.09 +/- 2.37degrees for CLH and 5.32 +/- 3.79 degrees for 3DH. No significant differences were found between the CLH expander group and the 3DH expander group for any of the measured variables. The bar graph (Figure 2) compares the changes (T1-T0) of each measurement between the CLH and 3DH expander groups.

The means, SD, and comparisons of the changes (T1-T0) for intercanine width and intermolar width within the expander groups are shown in Table V. Within both CLH and 3DH expander groups, the intermolar width change was significantly greater than the intercanine width change. The means, SD, and comparisons of the changes (T1-T0) for anterior suture opening and diastema width within the expander groups are shown in Table VI. Within each expander group, there are no significant differences between anterior suture opening and diastema width change.

Harms

There were no adverse events reported during the study period. One patient did not follow the study protocol and was eliminated from the study analysis. However, the patient continued comprehensive orthodontic treatment as planned.

Pain Perception

The Pearson correlation test revealed a high correlation between the VAS level and WB selected by participants, $r(290) = 0.77$, $p < 0.0001$. Table VII shows the descriptive statistics for the VAS score and the rating from the WB scale, categorized by expander type and day. A maximum VAS score of 100 was recorded for 3 timepoints in the CLH group whereas it was not recorded for any timepoints of the 3DH. During the first week of activation, only the first day reported a minimum VAS score of 0 for the CLH group while that same day was the only day that reported a non-zero minimum score. The results of the Shapiro-Wilk test indicated that nonparametric approaches are suitable for comparing VAS levels, implying that median values will be analyzed instead of mean values. Figure 3 illustrates the median VAS level indicated for each expander type at each timepoint of the study. The highest median scores related to PP were observed on the second day of activation, with a subsequent gradual decline in PP thereafter. The Wilcoxon rank-sum test compared the two expanders at each timepoint, revealing no statistical differences ($p > 0.05$) between the expanders at any timepoint (Table VIII). Despite not reaching the study's enrollment goal, a one-way repeated measures ANOVA was employed to explore the changes in pain over time in both expander types. Although one-way repeated measures ANOVA is robust to non-normality and other model violations, Mauchly's test of sphericity indicated that this assumption was violated, $\chi^2(5) = 11.3$, $p = .048$. Epsilon (ϵ) was 0.671. The Greenhouse and Geisser correction was applied to the one-way repeated measures ANOVA. The overall results indicate that although the main effect of timepoint was significant, the effect of the expander type was not. Therefore, only the main effect of time was interpreted, utilizing the Greenhouse-Geisser corrected degrees of freedom and p-value ($F(2,0) = 5.8$, $p = 0.01$). Pairwise comparisons using the Bonferroni adjustment revealed that the only timepoints showing a marginally significant difference were timepoints 7 (T3) and 14 (T5) (mean difference = 18.5, $p = 0.07$). Further implications of this result are discussed in the section on future analyses. Sufficient data was not available to conduct a comparable one-way repeated measures ANOVA for the variables "gender" and "age".

OHIP-14

Table IX displays the total OHIP-14 score by expander type, categorized by timepoint. Note that there is no minimum value of zero for the OHIP-14. The possible responses to each of the 14 questions of the questionnaire range from "never" (scored as 1) to "very often" (scored as 5), providing five qualitative

choices. Hence, the minimum possible total value for any completed questionnaire is 14, and the maximum possible total value is 70. At least one participant in each timepoint for both expander groups, except for T2, T3, and T4 in the conventional group, reported no impact (score of 14). The four charts in Figure 4 depict the mean score at four select timepoints (T1, T2, T3, and T5) by expander type, for each domain of questions. No significant difference ($p > 0.05$) was observed between expander type in any of these domains at any of these four timepoints. Table X presents the results of the independent samples t-tests for each domain, categorized by timepoint. Except for the total score at T3 ($p=0.02$) as shown in Figure 5, no differences were observed between the two expanders. Sufficient data was not available to conduct a comparable one-way repeated measures ANOVA for the OHIP-14 domains, as was the case for the "gender" and "age" variables.

We have published an article in Progress in Orthodontics (Bocklet M, Ahmadi F, Tremont T, Ross L, Yao H, Andrade I Jr. Comparison of 3D-printed and laboratory-fabricated Hyrax on stress distribution and displacement of the maxillary complex: a 3D finite element study. Prog Orthod. 2024 Mar 18;25(1):11. doi: 10.1186/s40510-024-00510-w. PMID: 38494544; PMCID: PMC10944817.) which, although not the primary objective of the funded project, was conceived, designed, and executed during the course of the main research. This publication reflects the scientific environment and intellectual contributions fostered by the ongoing work supported through this grant.

Were the original, specific aims of the proposal realized?*

The original specific aims of the proposal are in the process of being realized. The randomized clinical trial is still ongoing, with 32 of the planned 42 patients enrolled to date. While the final analysis will be completed once the full sample is collected, preliminary data from the first 22 patients has already generated meaningful findings, resulting in two master's theses at the Orthodontic Department of the Medical University of South Carolina.

In addition, a finite element study related to the project was conducted and published in a well-respected peer-reviewed journal, further supporting and complementing the experimental findings. These outcomes reflect significant progress toward achieving the proposed aims.

Were the results published?*

No

Have the results of this proposal been presented?*

No

To what extent have you used, or how do you intend to use, AAOF funding to further your career?*

The AAOF Orthodontic Faculty Development Fellowship Award has played a significant role in furthering my academic career. Through this funding, I was able to participate in three faculty development courses organized by the Academy for Advancing Leadership (AAL), a nationally recognized institution in health professions education. These experiences were instrumental in enhancing my skills as a teacher, researcher, mentor, and Program Director.

The courses provided valuable opportunities to engage with faculty from various dental specialties, fostering interdisciplinary collaboration and the exchange of ideas. They also strengthened my understanding of educational theory and leadership in academic dentistry. Importantly, the training contributed directly to my ability to design and implement a randomized clinical trial (RCT), improving both the quality and rigor of my research.

Overall, the AAOF funding has significantly supported my professional development and helped me grow as an academic leader in orthodontics.

Accounting: Were there any leftover funds?

\$6,657.37

Not Published

Are there plans to publish? If not, why not?*

Yes, there are plans to publish.

The randomized clinical trial is still ongoing, with 32 of the planned 42 participants enrolled. Once the target sample size is reached and final data analysis is completed, we intend to submit the results for publication in a peer-reviewed orthodontic journal.

Additionally, preliminary findings have already supported two master's theses and a finite element study, the latter of which has been published in a respected peer-reviewed journal. These efforts reflect our commitment to disseminating the outcomes of this research.

Not Presented

Are there plans to present? If not, why not?*

Yes, there are plans to present.

Preliminary findings from the ongoing randomized clinical trial have already been presented internally as part of two master's theses at the Orthodontic Department of the Medical University of South Carolina, and to the Angle Society of Orthodontists. Once the study is complete and the final data is analyzed, we plan to present the results at national meetings such as the American Association of Orthodontists (AAO) and the Angle Society of Orthodontists' conference. These presentations will help disseminate the findings to both clinical and academic audiences.

Internal Review

Reviewer Comments

George, based on the report, it sounds like the study is still being conducted: "The randomized clinical trial is still ongoing, with 32 of the planned 42 participants enrolled. Once the target sample size is reached and final data analysis is completed, we intend to submit the results for publication in a peer-reviewed orthodontic journal."

Can you confirm that the final report is supposed to reflect completion of the study (except for working on a manuscript)?

Comment: George, based on the report, it sounds like the study is still being conducted: "The randomized clinical trial is still ongoing, with 32 of the planned 42 participants enrolled. Once the target sample size is reached and final data analysis is completed, we intend to submit the results for publication in a peer-reviewed orthodontic journal."

Can you confirm that the final report is supposed to reflect completion of the study (except for working on a manuscript)?

I confirmed with Dr. Ildeu that he would like to keep the final report as-is. As such, I have marked the final report approved per my discussion with Dr. SAFB-GR 07/16/25

Reviewer Status*

Approved

File Attachment Summary

Applicant File Uploads

- Figures and Tables.pdf

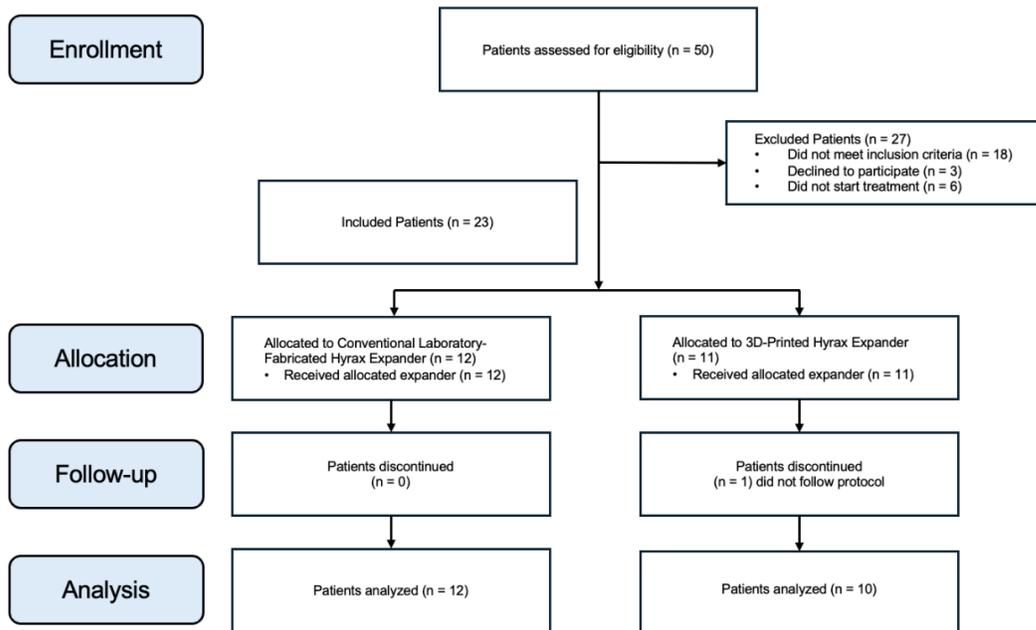


Figure 1: CONSORT flow diagram.

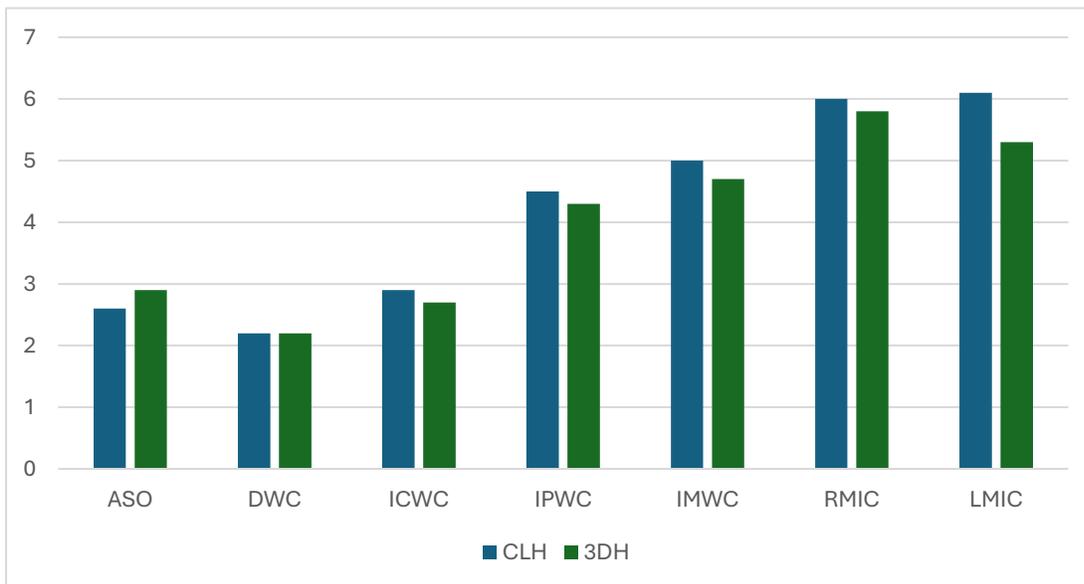


Figure 2: Bar graph comparing immediate maxillary changes (T1-T0) between CLH and 3DH expanders.

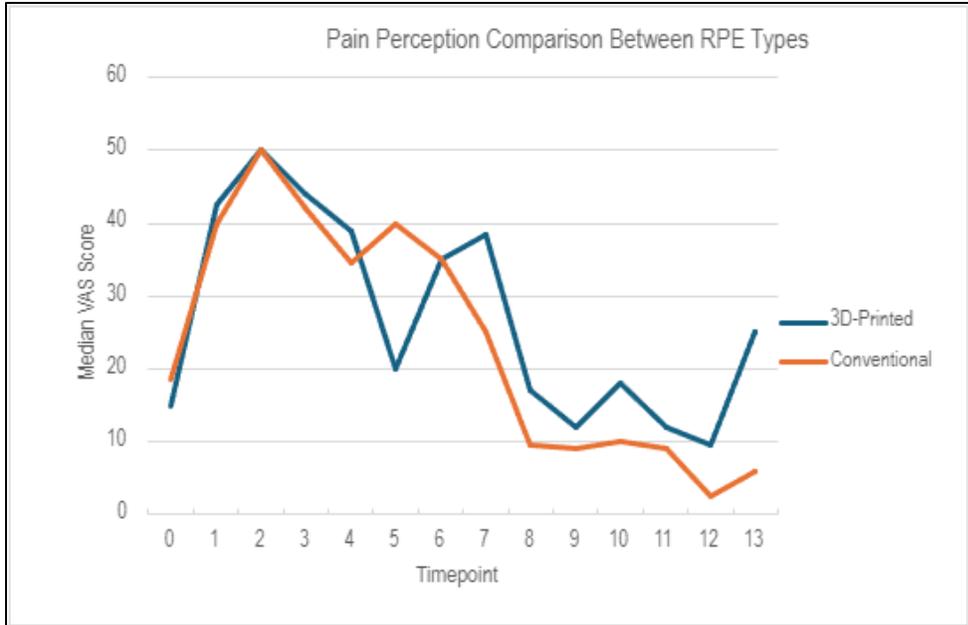


Figure 3: Comparison of the visual analogue scale (VAS) pain level between 3DH and CLH during the expander treatment period. Timepoint 0 in this graphic represents the day of impression (T_1). Subsequent successive days of activation are denoted by Timepoints 1-12, 13 signifies the day of expander removal (T_5).

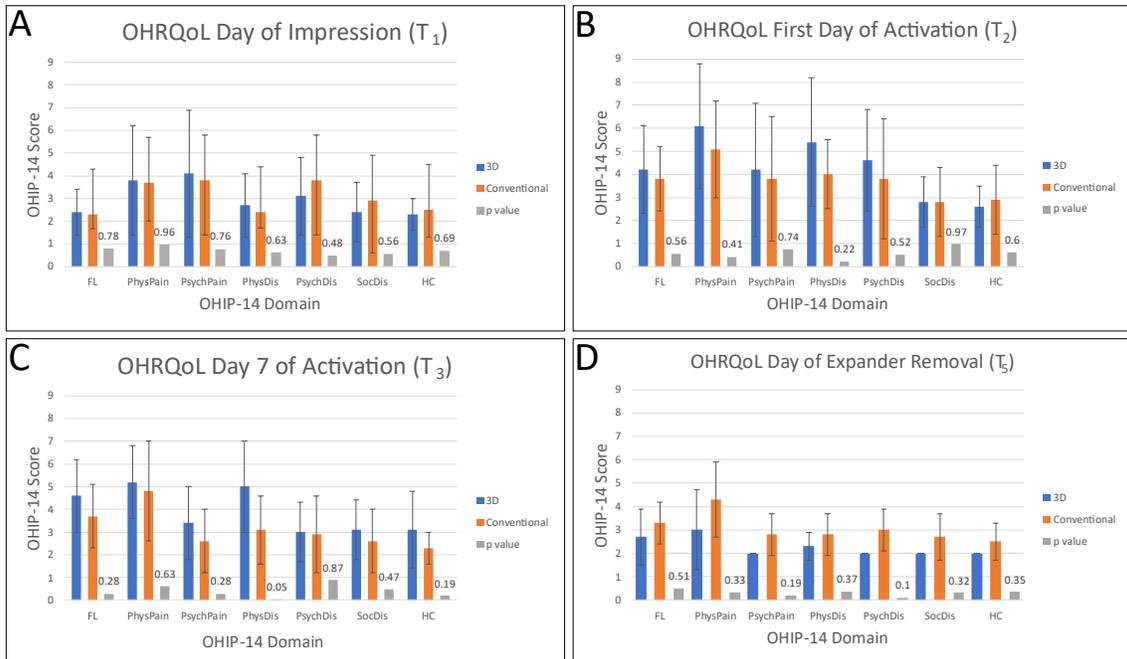


Figure 4: The comparison of the seven domains (Functional Limitations [FL], Physical Discomfort [PhysPain], Psychological Pain [PsychPain], Physical Disability [PhysDis], Psychological Disability [PsychDis], Social Disability [SocDis], and Handicaps [HC]) of the OHIP-14 between the 3DH and CLH groups is conducted during the expansion treatment.

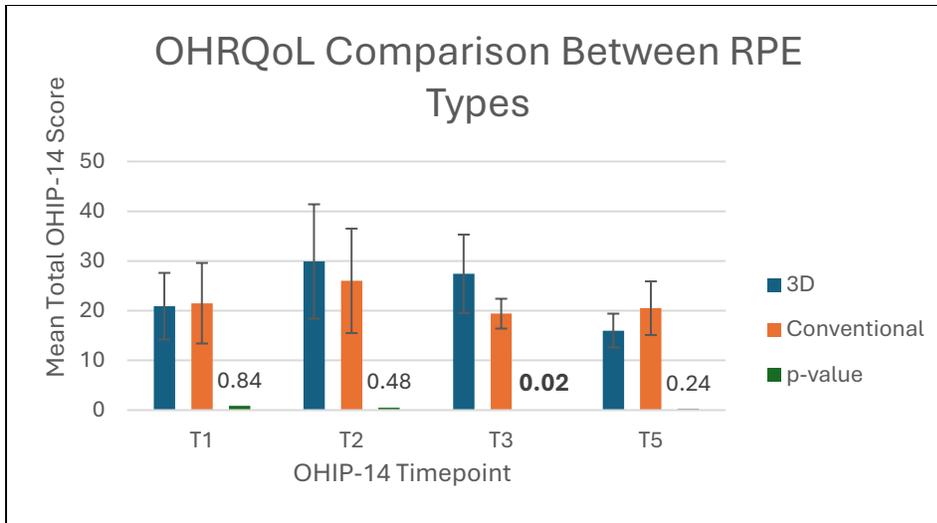


Figure 5: Comparison of the mean total OHIP-14 scores between the 3DH and CLH groups at T₁ (Impression), T₂ (Day 1 of Activation), T₃ (Day 7 of Activation), and T₅ (RPE Removal).

Tables

	CLH	3DH
Females	9 (75%)	4 (40%)
Males	3 (25%)	6 (60%)
Age 8-10	6 (50%) [5 F, 1 M]	3 (30%) [2 F, 1 M]
Age 11-13	6 (50%) [4 F, 2 M]	7 (70%) [2 F, 5 M]

Table I. Demographic information for the subjects in the study. F: Female patients, M: Male patients.

CLH					
	T0		T1		Significance
Variable	Mean	SD	Mean	SD	p-value
ASO	0.00	0.00	2.56	0.84	<0.0001*
DWC	0.24	0.72	2.43	1.06	<0.0001*
ICWC	24.95	1.87	27.85	1.67	0.0018*
IPWC	35.37	2.49	39.83	2.31	0.0002*
IMWC	46.71	2.46	51.68	2.43	<0.0001*
RMIC	158.79	6.77	164.82	6.19	0.0330*
LMIC	161.16	5.38	167.25	5.41	0.0113*

Table II: Comparison of immediate maxillary changes with the CLH Expander.

*Statistically significant ($p < 0.05$).

3DH					
	T0		T1		Significance
Variable	Mean	SD	Mean	SD	p-value
ASO	0.00	0.00	2.89	1.54	0.0005*
DWC	1.09	1.37	3.26	1.67	0.0054*
ICWC	25.31	2.39	28.04	3.15	0.0728
IPWC	34.65	1.99	38.93	1.31	<0.0001*
IMWC	45.56	1.91	50.21	1.86	<0.0001*
RMIC	161.22	7.20	166.99	7.58	0.0981
LMIC	162.57	8.87	167.89	10.31	0.2325

Table III: Comparison of immediate maxillary changes with the CLH Expander.

*Statistically significant ($p < 0.05$).

Variable	CLH (T1-T0)		3DH (T1-T0)		Significance
	Mean	SD	Mean	SD	p-value
ASO	2.56	0.84	2.89	1.54	0.5546
DWC	2.19	1.08	2.17	1.38	0.9674
ICWC	2.9	1.03	2.73	1.43	0.7672
IPWC	4.47	0.95	4.28	1.66	0.7433
IMWC	4.97	0.91	4.65	1.11	0.4692
RMIC	6.03	2.56	5.77	3.43	0.8438
LMIC	6.09	2.37	5.32	3.79	0.5665

Table IV: Comparison of the changes (T1-T0) between CLH and 3DH. *Statistically significant ($p < 0.05$).

Variable	Anterior Suture Opening		Diastema Width Change		p-value
	Mean	SD	Mean	SD	
CLH	2.56	0.84	2.19	1.08	0.3665
3DH	2.89	1.54	2.17	1.38	0.3008

Table V. Comparison of the changes (T1-T0) between ASO and DWC within each expander type. *Statistically significant ($p < 0.05$).

Variable	Intercanine Width Change		Intermolar Width Change		p-value
	Mean	SD	Mean	SD	
CLH	2.90	1.03	4.97	0.91	0.0001*
3DH	2.73	1.43	4.65	1.11	0.0080*

Table VI. Comparison of the changes (T1-T0) between ICWC and IMWC within each expander type. *Statistically significant ($p < 0.05$).

			3DH			CLH		
Days	n	Scales	Median	Min - Max	Mean (SD)	Median	Min - Max	Mean (SD)
0	11	VAS	15	0 - 41	13.7 (14.4)	18.5	0 - 100	29.4 (31.9)
		WB	2	0 - 4	1.3 (1.3)	2	0 - 8	1.8 (2.4)
1	11	VAS	42.5	4 - 85	40.9 (31)	40	0 - 100	46.5 (34.1)
		WB	4	0 - 8	3.5 (2.5)	2	2 - 8	4 (2.6)
2	9	VAS	50	0 - 65	40.4 (23)	50	10 - 85	46.9 (29.6)
		WB	4	0 - 6	4.2 (2.1)	4	2 - 10	4.8 (2.8)
3	9	VAS	44	0 - 93	43 (30)	42	10 - 100	43.1 (26.8)
		WB	4	0 - 8	3.8 (2.3)	4	0 - 6	4 (2)
4	9	VAS	39	0 - 87	37.6 (26.4)	34.5	10 - 66	35.3 (20.6)
		WB	2	0 - 10	3.3 (2.1)	2	0 - 6	2.5 (1.5)
5	9	VAS	20	0 - 73	26 (29)	40	10 - 74	38.3 (22.3)
		WB	2	0 - 6	2.2 (2.3)	4	0 - 6	3.1 (1.6)
6	9	VAS	35	0 - 86	37.9 (30.8)	35	5 - 77	32.6 (20.8)
		WB	2	0 - 8	2.9 (2.4)	2	0 - 8	3 (2.3)
7	10	VAS	38.5	0 - 61	41.5 (30.8)	25	0 - 57	27.7 (21)
		WB	3	0 - 4	3 (2.4)	2	0 - 4	2.3 (1.7)
8	8	VAS	17	0 - 50	24.4 (19.7)	9.5	0 - 66	17.9 (23.2)
		WB	3	0 - 4	2.5 (1.8)	1	0 - 6	1.5 (2)
9	9	VAS	12	0 - 50	19.1 (17.7)	9	0 - 50	16.3 (15.4)
		WB	2	0 - 4	2 (1.7)	2	0 - 4	1.4 (1.4)
10	9	VAS	18	0 - 65	21.2 (16.1)	10	0 - 50	17.7 (18.2)
		WB	2	0 - 6	2 (2)	2	0 - 4	1.4 (2)
11	8	VAS	12	0 - 86	16.9 (14.5)	9	0 - 50	13.3 (20)
		WB	2	0 - 4	1.5 (1.4)	0	0 - 66	1.1 (2)
12	8	VAS	9.5	0 - 100	17.8 (21.9)	2.5	0 - 50	12.3 (18)
		WB	2	0 - 4	1.8 (2)	1	0 - 66	1 (2.5)
13	6	VAS	25	0 - 100	31.2 (32.9)	6	0 - 6	5 (8.9)
		WB	1	0 - 8	1.3 (1.6)	0	0 - 50	0.5 (1.3)

Table VII. Descriptive statistics for both the 3DH and CLH groups are provided by day. Each day displays the statistics for both the VAS and WB. Day 0 refers to the day the impression was taken (T_1). Days 1 - 12 refer to the successive days of activation, and day 13 refers to the day the expander was removed (T_5). Min: Minimum; Max: Maximum; SD: Standard Deviation.

Days	VAS		WB	
	Z-statistics	p values	Z-statistics	p values
0	-1.1	0.27	-0.31	0.75
1	-0.44	0.66	-0.36	0.72
2	-0.83	0.4	-0.24	0.81
3	-0.4	0.97	-0.34	0.73
4	0.21	0.83	0.64	0.53
5	-1	0.3	-1.09	0.28
6	0.32	0.75	-0.11	0.91
7	0.99	0.32	0.52	0.6
8	0.98	0.33	1.26	0.21
9	0.65	0.52	0.82	0.41
10	0.91	0.36	0.65	0.52
11	0.881	0.38	0.64	0.52
12	0.55	0.58	0.74	0.46
13	1.4	0.17	0.99	0.32

Table VIII: Wilcoxon rank sum test results comparing both expander types at each timepoint.

Timepoints	3DH				CLH			
	n	Median	Min - Max	Mean (SD)	n	Median	Min - Max	Mean (SD)
1	11	15	14 - 33	19.6 (7.1)	12	19.5	14 - 38	23.7 (9.5)
2	9	24	14 - 30	21.1 (6.8)	11	18	14 - 42	21.9 (8.2)
3	9	33	14 - 48	31.2 (12)	8	22.5	17 - 49	27.3 (11.7)
4	9	32	14 - 41	29.1 (8.3)	7	20	17 - 29	21.1 (4.4)
5	8	28	14 - 46	27.5 (10.5)	10	19.5	16 - 26	20.3 (3.8)
6	3	14	14 - 22	16.7 (4.6)	6	22	14 - 30	22.5 (5.7)

Table IX: OHIP-14 Total Score, categorized by expander type and timepoint. Min: Minimum; Max: Maximum; SD: Standard Deviation.

Domains	T1			T2			T3			T5		
	3DH Mean (SD)	CLH Mean (SD)	p	3DH Mean (SD)	CLH Mean (SD)	p	3DH Mean (SD)	CLH Mean (SD)	p	3DH Mean (SD)	CLH Mean (SD)	p
FL	2.4 (1.0)	2.3 (0.65)	0.8	4.2 (1.9)	3.8 (1.4)	0.56	4.6 (1.6)	3.7 (1.4)	0.28	2.7 (1.2)	3.3 (0.9)	0.51
PhysPain	3.8 (2.4)	3.7 (1.7)	1	6.1 (2.7)	5.1 (2.1)	0.41	5.2 (1.6)	4.8 (2.2)	0.63	3.0 (1.7)	4.3 (1.6)	0.33
PsychPain	4.1 (2.8)	3.8 (2.4)	0.8	4.2 (2.9)	3.8 (2.7)	0.74	3.4 (1.6)	2.6 (1.4)	0.28	2.0 (0)	2.8 (0.9)	0.19
PhysDis	2.7 (1.4)	2.4 (0.7)	0.6	5.4 (2.8)	4.0 (1.8)	0.22	5.0 (2.0)	3.1 (1.5)	0.05	2.3 (0.6)	2.8 (0.9)	0.37
PsychDis	3.1 (1.7)	3.8 (2.3)	0.5	4.6 (2.2)	3.8 (2.8)	0.52	3.0 (1.3)	2.9 (1.7)	0.87	2.0 (0)	3.0 (0.89)	0.1
SocDis	2.4 (1.3)	2.9 (2.3)	0.6	2.8 (1.1)	2.8 (1.5)	0.97	3.1 (1.3)	2.6 (1.4)	0.47	2.0 (0)	2.7 (1.0)	0.32
HC	2.3 (0.7)	2.5 (1.2)	0.7	2.6 (0.88)	2.9 (1.5)	0.6	3.1 (1.7)	2.3 (0.7)	0.19	2.0 (0)	2.5 (0.8)	0.35
Total	20.9 (6.7)	21.5 (8.1)	0.8	29.9 (11.5)	26.0 (10.5)	0.48	27.4 (7.9)	19.4 (3.0)	0.02	16.0 (3.4)	20.5 (5.4)	0.24

Table X. Independent samples t-tests were conducted for each domain by timepoint and expander group.