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Dental Hygienists' Opinions About Loupes In Education

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Purpose. *The present study was conducted in order to explore dental Hygienists' perceptions of the advantages and disadvantages of loupes, and the extent to which dental hygienists believe loupes should be utilized in the educational setting.*

Methods. *Dental hygienists were contacted through a popular dental hygiene website and were asked to participate in a survey regarding the use of loupes. Eight hundred sixty-eight valid surveys were completed. Participants were asked to indicate the extent to which they use loupes, the environments in which they have used loupes, when they think loupes should be introduced to students in dental hygiene school, and the advantages and disadvantages of using loupes.*

Results. *Results indicated approximately 60.5% of practicing dental hygienists surveyed for the study always or sometimes use loupes, however only 21% had actually used loupes as a student. A number of differences were found between those respondents who use loupes and those who do not use loupes in regards to how they believe loupes should be used in education. Alleged advantages of using loupes received much greater support than alleged disadvantages. Members of the American Dental Hygienists' Association (ADHA) were much more likely to always use loupes than non-ADHA respondents.*

Conclusion. *Dental hygienists participating in the survey believe that loupes should be introduced to dental hygiene students, although many believe using loupes should be an option while in school. Wide agreement exists among dental hygienists in regards to the advantages of using loupes. The authors contend that loupes are a vital tool that students should learn how to use, but the use of loupes should be optional once a student has learned how to use them properly.*

Keywords: loupes, dental hygiene, student, education, magnification, ergonomics

Introduction

Controversy exists in the dental hygiene field as to if and when loupes should be introduced to dental hygienists. This is likely due to the fact that using loupes in the practice of dental hygiene is still a fairly new concept, and as with any new concept it is expected that it will be met with some resistance. More evidence is mounting regarding the advantages of using loupes in both patient care and for the dental hygienists themselves. Even though science may say the use of loupes is advantageous, it is extremely important to determine if dental hygienists recognize and understand the advantages loupes provide.

The present study explored dental Hygienists' opinions regarding the use of loupes in practice and education. Dental hygienists were asked to indicate if they agreed that an item was an advantage or a disadvantage in clinical practice.

Advantages and disadvantages explored included radiographic evaluations, tactile sensitivity for calculus detection, caries detection, restoration detection, soft tissue evaluations, and accuracy of periodontal probe readings by clinicians wearing loupes. The current study also explored clinician related factors such as ergonomics, confidence, and quality of care. Respondents were also asked to indicate whether or not they think loupes would have been beneficial to them while they were in school, when students should be introduced to loupes, and if using loupes should be a requirement or an option for students. Overall, the opinions gathered in this study provide strong support for the advantages of using loupes and their use in the educational setting.

Literature Review

Clinicians are always looking for new instruments that allow them to perform their jobs at a higher level and ease the physical stresses of daily work. Loupes are one possible way to improve performance as well as help ease daily physical challenges associated with the practice of medicine and dentistry. Magnification has been an important part of medicine and dentistry for many years. The use of loupes is widespread in medicine, especially in fields like cardiothoracic and pediatric surgery where magnification is essential to performing the job correctly.¹ Also, the use of loupes and magnification in dentistry has increased over the past 25 years.²

One reason for the increased use of loupes in dentistry is that loupes have the potential to reduce the number of clinical errors by 50%.³ Not only do loupes help reduce clinical errors, they have also been shown to aid in detection of early carious lesions, crown margin defects, and in the assessment of possible microleakage around restorations.³ Loupes may also help the user to actually gain visual access into the sulcus of a tooth with great detail.² In turn, loupes allow for direct visualization into root canals, root fractures, and help in general dental diagnosis. Loupes may also help clinicians distinguish natural tooth surfaces from tooth-colored restorations.^{4,5}

Besides the benefits to clinical diagnosis and treatment, research also suggests that loupes can help alleviate some of the physical stress to the body of a practitioner while he or she is treating a patient. Data suggests that dental professionals are at the risk for occupational musculoskeletal injury.^{4,6-12} Research also indicates that there is a correlation between seeing clearly and maintaining good posture.⁶ Without the ability to see fine detail, the clinician might contort his or her body into positions that can become detrimental over time. Loupes reduce natural head tilt, which allows the user to have less strain on the neck and upper back muscles.^{6,7}

Despite the many advantages, a number of disadvantages of using loupes have also been identified. Loupes may feel cumbersome to wear at first, requiring an adjustment period on the part of the clinician.² Another problem with loupes occurs if prescription eyewear is being worn. If the convergence of the 2 eyepieces is not equal, fatigue, headaches, eyestrain, and double vision can occur. Other problems associated with initial use of loupes can be increased weight on the bridge of the nose and decreased field of view.² Also, loupes may be ineffective when extremely fine detail is needed as in detecting root canal orifices.^{13,14} A final minor drawback of loupes is that infection control can be difficult since some loupes do not tolerate disinfectants.¹⁵

With all of the research demonstrating the benefits of using loupes in clinical practice, one would think that clinicians of any type who might need magnification would be exposed to loupes while in school. This is not necessarily the case, especially in dental hygiene schools. Formal training with loupes for undergraduates may be the next step for most dental and dental hygiene schools.² It has been suggested that incorporating loupes while in dental hygiene school encourages proper ergonomics, instrumentation, improved patient care, and enhanced sharpening skills that will benefit a dental hygienist throughout his or her lifetime.¹⁶ One study demonstrated that students approached their clinical boards with more confidence while wearing loupes and had more confidence when entering the workplace.¹⁵ Another study showed that students felt they performed their clinical work better, and 95% reported they had better visual acuity when using loupes.⁷

Most of the previously mentioned studies of magnification focused primarily on surgeons and dentists. Surprisingly, little research has been conducted to assess the extent of loupe usage by dental hygienists and dental Hygienists' opinions about the use of loupes in education. Studies have shown that some distinct advantages exist for using loupes in fields where magnification is needed, but whether or not dental hygienists know about and agree with the advantages and disadvantages

of using loupes has received little attention. Likewise, dental Hygienists' opinions about using loupes in education and when students should be introduced to loupes have received little attention.

The current study was conducted to explore dental Hygienists' opinions about possible advantages and disadvantages of using loupes in clinical practice and opinions about the use of loupes in education. While many hygienists may use loupes in private practice, the number that actually used them in school is likely very small. The current study was conducted in order to determine if dental hygienists would recommend the use of loupes in school and when they would incorporate loupes into the education of dental hygienists. With these factors in mind, the following hypotheses were developed and explored:

Hypothesis 1. A large percentage of dental hygienists will support the alleged advantages of loupes. Alleged disadvantages of loupes usage will receive minimal support from all dental hygienists.

Hypothesis 2. Dental hygienists who currently use loupes will be more supportive of the use of loupes in the educational setting and will agree that loupes would be beneficial in the educational setting more so than those who do not use loupes.

Methods and Materials

A new survey instrument was developed to obtain dental Hygienists' opinions about loupes in education. The survey instrument was developed and administered under a blanket Institutional Review Board (IRB) approval from the University of Bridgeport for educational research conducted in a university research course. First, the survey was administered on paper to students in a dental hygiene research course at the University of Bridgeport. Based on feedback from the students, the survey was revised to eliminate any confusion in order that the desired information would be captured. The revised instrument was then converted into an internet survey form. The survey was then submitted to a dental hygiene website, with a link to the survey, for further pilot testing with registered dental hygienists. Sixty-six surveys were completed with feedback provided via email by the respondents. The data from this pilot study were analyzed to determine if the desired information was being captured and to ensure that responses to all of the items followed reasonable distributions. Results demonstrated that respondents were using the instrument as intended, and distributions of responses were within acceptable limits. Ultimately, the data from the pilot study were included in the final analysis.

The survey was then distributed to another website for the primary data collection. Dental hygienists were asked to participate in a survey regarding the use of loupes in the dental setting. Participants were assured that all information collected was completely anonymous. A total of 822 surveys were completed, with 802 considered valid. Twenty surveys were discarded due to the fact that the respondents were current dental hygiene students. The 66 responses from the pilot study were then included in the final data set for a total of 868 valid surveys completed.

Participants completed a survey that consisted of 15 items. Demographic information such as age, gender, years in practice, location, and ADHA membership was collected. The remaining items were a combination of multiple choice and "choose all that apply." Respondents indicated their current loupe usage and the environments in which they have used loupes (school, private practice, etc). Respondents were asked to identify all of the items they thought were advantages or disadvantages of using loupes in the practice of dental hygiene. They were also asked if they felt loupes would have beneficial to them when they were in school, how loupes should be introduced to students (as a requirement, an option, or not at all) and when dental hygienists should be introduced to loupes (first year of school, second year, when starting private practice, after a few years of practice, or never). See Figure 1a, 1b, 1c, 1d, for the complete survey.

Figure 1A: Internet Survey Form

Dental Magnification Loupes

Please take a few minutes of your time to reply honestly to the following survey.
This survey is completely anonymous and will be used for educational purposes only.

1) Gender:

Male

Female

2) Age:

3) What dental hygiene school did you attend?

4) How many years have you been a licensed dental hygienist?

5) Where do you primarily practice dental hygiene (please list state) or teach dental hygiene (please list the name of the school)?

6) Approximately how many hours per week do you practice Dental Hygiene?

7) Have you ever worked in an educational setting?

- Yes
- No

8) Do you currently use loupes when you are practicing dental hygiene?

- Yes, always
- Yes, sometimes
- No, but I plan to in the future
- No, never

9) In what environment have you used loupes?
(Please check all that apply)

- As a student
- As an educator
- In private practice
- None

Other (Please Specify):

10) How would you recommend the use of loupes in the educational setting?

- As a requirement
- As an option
- Not at all

11) When should a hygienist be first introduced to loupes?

- First year of dental hygiene school
- Second year of dental hygiene school
- When starting in private practice
- After a few years of private practice
- Never

12) What do you feel are the advantages of loupes?
(Please check all that apply)

- | | |
|---|--|
| <input type="checkbox"/> Ergonomics/posture | <input type="checkbox"/> Radiograph evaluations |
| <input type="checkbox"/> Caries detection | <input type="checkbox"/> Calculus removal |
| <input type="checkbox"/> Periodontal probe readings | <input type="checkbox"/> Confidence |
| <input type="checkbox"/> Restoration detection | <input type="checkbox"/> Soft tissue evaluation |
| <input type="checkbox"/> Quality of care | <input type="checkbox"/> Increased sharpening accuracy |
| <input type="checkbox"/> None | Other (Please Specify): <input type="text"/> |

13) What do you feel are the disadvantages of loupes?
(Please check all that apply)

- | | |
|--|--|
| <input type="checkbox"/> Vision dependency | <input type="checkbox"/> Adjustment period |
| <input type="checkbox"/> Limited depth of vision | <input type="checkbox"/> Fatigue |
| <input type="checkbox"/> Headache | <input type="checkbox"/> Infection control |
| <input type="checkbox"/> False sense of security | <input type="checkbox"/> Cost-to-benefit ratio |
| <input type="checkbox"/> Uncomfortable | <input type="checkbox"/> Decreased tactile sensitivity |
| <input type="checkbox"/> None | Other (Please Specify): <input type="text"/> |

14) Do you feel loupes were or would have been beneficial for you in the educational setting (introduced in your curriculum while in school)?

- Yes
- No

15) Are you currently a member of the American Dental Hygienists' Association (ADHA)?

- Yes
- No

Frequencies of responses were examined for all demographic and survey items. Demographics were explored through the use of percentages and means. Chi-square analysis was the primary statistical procedure used to examine potential differences in frequencies of responses based on group membership, which was derived from a variety of variables such as current loupe usage and ADHA membership. A non-response to an item was not included in the analysis of that particular item. Thus the N for the various analyses may be different depending on how many participants did not answer an item.

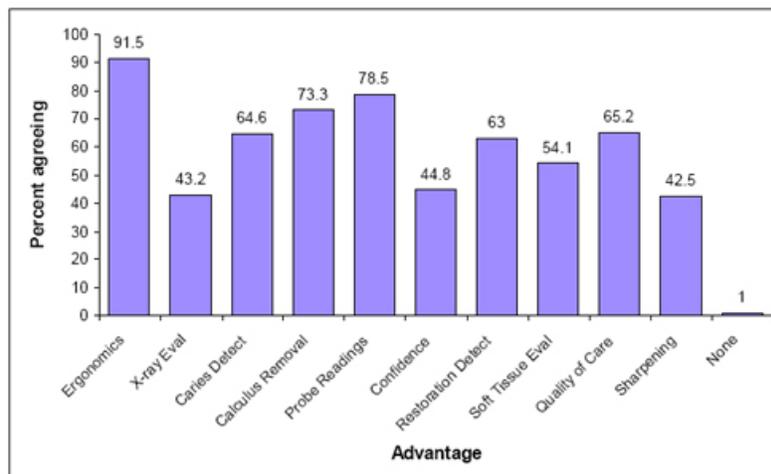
Results

Examining the demographics of the survey responses indicated that 97.9% of the participants were female, 72% were ADHA members, 26.4% have worked in an educational setting, mean age was 40.56 years, mean years licensed was 13.46 years, and mean hours worked per week was 28.61.

When asked to indicate how often they used loupes, 44.3% responded always, 16.2% sometimes, 20.8% plan to, and 18.7% never use loupes. Only 21.4% indicated that they used loupes as a student, 9.4% as an educator, 59.7% in private practice, and 30.2% had never used loupes. Approximately 85.2% of respondents agreed that loupes were or would have been beneficial to them while in school. When asked how loupes should be implemented in the educational setting, 38.2% said as a requirement, 59.7% as an option, and 2.1% not at all. Participants were then asked to indicate when loupes should be introduced to a dental hygienist; 56.9% said in the first year of dental hygiene school, 37.4% in the second year of dental hygiene school, 0.9% when starting private practice, 4.2% after a few years in private practice, and 0.6% never.

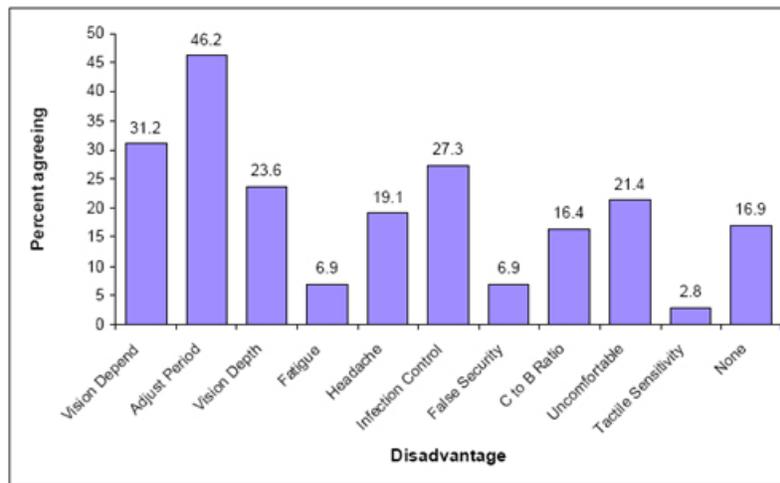
Participants were then asked to check all of the responses that they felt were advantages of loupe usage. The following values indicate the percentage of respondents that agreed that an item was an advantage of using loupes: ergonomics 91.5%, radiographic evaluations 43.2%, caries detection 64.6%, calculus removal 73.3%, probe readings 78.5%, confidence 44.8%, restoration detection 63%, soft tissue evaluations 54.1%, quality of care 65.2%, sharpening 42.5%, and no advantage 1.0%. See Figure 2 for graphical representation of results.

Figure 2. Percentages agreeing that an item is an advantage of using loupes



Participants were then asked to check all of the responses that they felt were disadvantages of loupe usage. The following values indicate the percentage of respondents that agreed that an item was a disadvantage of using loupes: vision dependency 31.2%, adjustment period 46.2%, limited depth of vision 23.6%, fatigue 6.9%, headache 19.1%, infection control 27.3%, false sense of security 6.9%, cost-to-benefit ratio 16.4%, uncomfortable 21.4%, decreased tactile sensitivity 2.8%, and no disadvantages 16.9%. See Figure 3 for graphical representation of results.

Figure 3. Percentages agreeing that an item is a disadvantage of using loupes



Relationships between current loupe usage (yes, always; yes, sometimes; no, but plan to; no, never) and frequency of responses to other items were examined through the use of the chi-square statistic. Chi-square values and their level of significance are reported followed by a brief description of the most noteworthy findings of the individual analysis

A significant relationship (chi-square (6) = 155.04, $p < 0.001$) was found for how respondents would recommend the use of loupes in the educational setting and loupe usage. Of those people who always use loupes, 58.8% said that loupes should be a requirement, while only 10.1% of those people who never use loupes said that loupes should be required while in school. However, 82.9% of those people who never use loupes thought that students should have the option of using loupes in dental hygiene school (Table I).

Table I. Loupes recommendation in education by current loupe usage

			Loupes recommendation			
			Requirement	Option	Not at all	Total
Loupe usage	Yes, always	Count	224	156	1	381
		Row %	58.8%	40.9%	.3%	100.0%
	Yes, sometimes	Count	41	98	1	140
		Row %	29.3%	70.0%	.7%	100.0%
	No, but plan to	Count	44	126	5	175
		Row %	25.1%	72.0%	2.9%	100.0%
	No, never	Count	16	131	11	158
		Row %	10.1%	82.9%	7.0%	100.0%
	Total	Count	325	511	18	854
		Row %	38.1%	59.8%	2.1%	100.0%

Pearson Chi-Square Tests

		Loupes recommendation
Loupe usage	Chi-square	155.037
	df	6
	Sig.	.000(*)

* $p < 0.001$

A significant relationship was found for opinions in regards to when loupes should be introduced to a dental hygienist and loupe usage (chi-square (12) = 71.86, $p < 0.001$). The largest difference in responses was found between those respondents who always use loupes and those who never use loupes. Of those people who always use loupes, 66.8% thought that loupes

should be introduced in the first year, while only 45.6% of those who never use loupes thought that loupes should be introduced in the first year. (Table II).

Table II. When to introduce students to loupes by current loupe usage

			When to introduce students to loupes					Total
			First year	Second Year	Starting private practice	After few years in private practice	Never	
Loupe usage	Yes, always	Count	254	116	5	5	0	380
		Row %	66.8%	30.5%	1.3%	1.3%	.0%	100.0%
	Yes, sometimes	Count	65	69	0	5	0	139
		Row %	46.8%	49.6%	.0%	3.6%	.0%	100.0%
	No, but plan to	Count	96	71	3	10	0	180
		Row %	53.3%	39.4%	1.7%	5.6%	.0%	100.0%
	No, never	Count	73	66	0	16	5	160
		Row %	45.6%	41.3%	.0%	10.0%	3.1%	100.0%
Total	Count	488	322	8	36	5	859	
	Row %	56.8%	37.5%	.9%	4.2%	.6%	100.0%	

Pearson Chi-Square Tests

		When intro to loupes
Loupe usage	Chi-square	71.857
	df	12
	Sig.	.000(*)

*p<0.001

For the item asking if loupes would have been beneficial while in school, 95.0% of those people who always use loupes agreed that loupes would have been beneficial while in school, while only 61.8% of those who never used loupes agreed that loupes would have been beneficial to them while in school (chi-square (3) = 96.77, p < 0.001) (Table III).

Table III. Thought loupes were/would have been beneficial to them while in school by current loupe usage

			Beneficial while in school		
			Yes	No	Total
Loupe usage	Yes, always	Count	360	19	379
		Row %	95.0%	5.0%	100.0%
	Yes, sometimes	Count	118	22	140
		Row %	84.3%	15.7%	100.0%
	No, but plan to	Count	152	26	178
		Row %	85.4%	14.6%	100.0%
	No, never	Count	97	60	157
		Row %	61.8%	38.2%	100.0%
Total	Count	727	127	854	
	Row %	85.1%	14.9%	100.0%	

Pearson Chi-Square Tests

		Beneficial while in school
Loupe usage	Chi-square	96.771
	df	3
	Sig.	.000(*)

*p<0.001

A significant relationship was found between ADHA membership and loupe usage chi-square (3) = 74.65, p < 0.001). ADHA members were more likely to always use loupes (51.4%) compared to people who were not ADHA members (25.7%) (Table IV).

Table IV. Member of ADHA by current loupe usage

			Loupe usage				Total
			Yes, always	Yes, sometimes	No, but plan to	No, never	
Member of ADHA	Yes	Count	320	110	110	83	623
		Row %	51.4%	17.7%	17.7%	13.3%	100.0%
	No	Count	62	30	70	79	241
		Row %	25.7%	12.4%	29.0%	32.8%	100.0%
	Total	Count	382	140	180	162	864
		Row %	44.2%	16.2%	20.8%	18.8%	100.0%

Pearson Chi-Square Tests

		Loupe usage
Member of ADHA	Chi-square	74.653
	df	3
	Sig.	.000(*)

*p<0.001

Discussion

In support of the hypothesis regarding current loupe usage and opinions about the implementation of the use of loupes in the educational setting, approximately 85.0% of dental hygienists surveyed (95% of those who always use loupes) thought that loupes would have been beneficial to them if used while in school. Although such a large percentage thought that loupes are beneficial in education, only 38.2% thought they should be required, while 59.7% thought they should be an option. Results show that respondents who always use loupes are more likely to support loupes being introduced earlier

and as a requirement for students. However, even those respondents who always use loupes did not overwhelmingly agree that loupes should be a requirement. This suggests that while dental hygienists believe loupes are beneficial, they also believe students should be allowed to choose when and if they want to utilize loupes.

This study, combined with previous research, suggests that if a dental hygienist chooses to use loupes, both the dental hygienist and patients are likely to benefit in a number of ways. In support of the hypothesis regarding advantages and disadvantages of loupes, a large percentage of respondents agreed with the alleged advantages, while much smaller percentages agreed with the alleged disadvantages. The most widely supported advantages were ergonomics, calculus removal, caries detection, probe readings, and overall quality of care. These results demonstrate that even those respondents who do not use loupes recognize the benefits to themselves and their level of clinical care. The question remains, if people realize all of these benefits, why does such a large percentage (39.5%) continue to not use loupes?

We explored this question by asking dental hygienists to identify the disadvantages of using loupes. Vision dependency, adjustment period, infection control, and limited depth of vision were among the most agreed upon disadvantages. However, the percentages of respondents identifying these as disadvantages of using loupes were generally very low. The largest perceived disadvantage was adjustment period, with 46.2% respondents saying that they thought an adjustment period was necessary. This finding is very consistent with the previous literature. However, this finding could support the argument that loupes should be introduced to dental hygienists as soon as possible in the educational process so they can become accustomed to utilizing them properly. On the other hand, introducing loupes early to students could lead to even greater vision dependency on loupes during clinical practice. This could affect not only the learning process, but also the general vision of the user further down the road. The long-term effects of loupes on vision dependency and general vision of the user are topics that need to be addressed by future research.

Interestingly, respondents who were ADHA members were twice as likely to always use loupes compared to nonmembers. This is probably due to the fact that ADHA members are more aware of state-of-the-art techniques related to dental hygiene because they are generally more involved in the field. However, only about half of ADHA members surveyed always use loupes. Further research is needed in order to determine why ADHA members do or do not use loupes. Perhaps the current study, and others that will follow, can demonstrate to the remaining nonusers the advantages of using loupes in practice and in the educational setting.

Overall, the results of this study could impact the practice of dental hygiene in many ways, especially in the educational arena. Any dental hygiene school that does not currently allow students at least the option to use loupes should reconsider its position since such a large percentage of dental hygienists surveyed indicated that they felt loupes would have been beneficial to them in dental hygiene school. Also, the large percentage of respondents that identified advantages of using loupes demonstrates how using loupes can be beneficial to both the dental hygienist and the patient. The implication is that if students are taught to properly use loupes, they are likely to see benefits in ergonomics for themselves and in clinical practice in areas such as calculus removal. Ultimately, it is not only the dental hygienist that will benefit from being introduced to loupes in the educational setting, but also the patient.

Limitations

The present study was an opinion survey and no causal relationships can be determined. Another potential limitation of the present study is that the results may not represent the opinions of all dental hygienists. The present study was limited to dental hygienists who use the internet and voluntarily participated. There could be fundamental differences in the opinions of those people who do not use the internet or who were unwilling to participate in this survey. However, results of the present study are credible because of the large sample size, variation of loupe usage, and variation in responses to the survey items.

Summary and Conclusions

The present study demonstrates that even though all dental hygienists who responded are not currently using loupes, a large percentage believe that loupes would have been beneficial in their education. Also, this study shows that there is wide agreement among the respondents as to the advantages of using loupes (ie, ergonomics, calculus removal, probe

readings, etc). The present study was a starting point for research into the benefits of loupes in the educational setting. Further research is needed to determine if those people who use loupes in school actually experience the advantages identified in the present study. If future research continues to demonstrate results similar to those observed here, it would be hard to argue against loupes as a necessary tool of the dental hygienist who wishes to provide the highest quality of care.

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Notes

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