
A survey of retention and retainer practices of orthodontists in Australia

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Objective: To survey retention and retainer practices of orthodontists in Australia.

Methods: A pilot-tested e-survey was distributed to 502 eligible members of the Australian Society of Orthodontists (ASO). The questions addressed participant background information, preferred retainer and retention practices, retainer characteristics and factors influencing retainer choice. Statistical analyses were performed using PASWH version 18.

Results: The response rate was 58%. Thermoplastic retainers (TRs) were the most commonly chosen retainer in the maxilla (39.4%) and bonded retainers (BRs) were most commonly chosen in the mandible (38.5%). An initial period of full-time wear of removable retainers (RRs) was prescribed by 37.7–48.3%. 'Night/sleeping with reducing frequency over time' was the most commonly prescribed part-time RR wear practice (28.1–33.5%).

Indefinite retainer wear was recommended by 85.3–87.4% of orthodontists. Indefinite retainer checks were carried out by 19.1–19.8% of orthodontists while 28.9–43.6% were 'not happy' for general dental practitioners (GDPs) to continue retention checks. Adjunctive retention practices were used by 25.6–72.8%. Pre-fabrication TR sheet thickness of 1.0 mm (68%) and polypropylene co-polymer/ethylene material type (55.8%) were most commonly used. Vacuum-forming was the preferred mode of TR fabrication by 48.4%. 'Stainless steel single strand round' was the most commonly used BR material type (33.4%). BR bonded to 12-22 (bonded to four teeth) was the most common BR design in the maxilla (48.8%) and 33-43 (bonded to six teeth) was most commonly chosen for the mandible (81.5%). Inadvertent tooth movement associated with BRs was observed by 62%. The orthodontist factor that most influenced retainer choice was the nature of the pretreatment malocclusion (88%).

Conclusion: Although there is agreement that retention is indefinite, orthodontic retention practices and retainer characteristics vary considerably between orthodontists in Australia. Greater communication between orthodontists and GDPs is required to effectively manage retention over the long term.

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Introduction

Most patients are provided with retainers upon the completion of orthodontic treatment so that the risk of relapse and age-related changes affecting the occlusion and tooth alignment is minimised. High quality evidence regarding orthodontic retention is lacking and investigations conducted in many countries have indicated the use of a wide variety of retainers and associated retention practices.¹⁻¹⁵ Some general trends, however, are becoming apparent. Thermoplastic retainers (TRs) appear to have become the preferred removable retainer (RR) and bonded retainers (BRs) are increasing in popularity. There

also appears to be agreement between orthodontists that indefinite retainer wear is required to maintain orthodontic treatment results.

Findings from research directed at orthodontists in Australia appears to mirror these trends.^{3,16} In 2004, a comprehensive survey to determine retention procedures was carried out among orthodontists in Australia.³ It reported that TRs were the most commonly prescribed retainers in the maxilla *and* mandible, with 23.7% of orthodontists advocating 'lifetime' retention. A 2013 survey investigating orthodontic practice procedures in Australia indicated that BRs were becoming more commonly placed in

the mandible and, in addition, 68% of orthodontists were recommending 'lifetime' retention.¹⁶ Indefinite retention, however, requires ongoing management of retention and the retainers. Greater involvement of the general dental practitioner (GDP) in patient management may be required as the number of patients in 'indefinite retention' increases in the future.¹⁷⁻¹⁹ Disappointingly, there is little information regarding patient management of his/her retention and retainers over the long term.^{9,17}

In addition, procedures such as circumferential supracrestal fiberotomy (CSF) and interproximal enamel reduction (IPR) have been used as adjuncts to retention practices and/or alternatives to retainers and may be potential considerations in the prevention of relapse.²⁰⁻²²

Although national surveys on retention practices have been expansive, most have not assessed retainer characteristics such as material type, dimensions and mode of fabrication.^{23,24} This aspect is important as evidence suggests that these characteristics may influence retainer effectiveness. In addition, no national survey appears to have investigated orthodontists' attitudes towards GDP management of retainers in the post-orthodontic treatment phase, and few have explored the use of adjunctive retention procedures.

The aims of the present study, therefore, were to survey retention practices and retainer characteristics of orthodontists in Australia. Also considered were factors regarding the attitudes of orthodontists towards GDPs in the management of retainers, as well as adjunctive retention procedures.

Material and methods

Ethical approval for this study was granted by the Office of Research Ethics, Compliance and Integrity, University of Adelaide (H-2018-207). Orthodontics is one of 13 approved specialties for dental practitioners in Australia. The 'specialist title' orthodontist can only be used by those registered dental practitioners who satisfy standards laid down by the Dental Board of Australia and who are registered with the Australian Health Practitioner Regulation Authority (AHPRA) under the specialty of orthodontics. Only dental practitioners who are registered as orthodontists with AHPRA can become members of the Australian Society of Orthodontists (ASO). Over 80% of

AHPRA registered orthodontists are members of the ASO.²⁵

An original survey was developed, using elements of orthodontic retention surveys conducted in other countries.^{5,9,14} Pre-piloting and piloting was carried out to:

- Determine the approximate time taken to complete the survey
- Establish clear understanding of the questions and
- Ensure the validity of the questions for an Australian orthodontic population.²⁶

The survey was comprised of seven sections, containing mainly multiple-choice questions. Section A addressed participant demographic information. Sections B and C consisted of questions on the use of different retainer types and retention protocols in the maxilla and mandible. Section D contained questions on adjunctive retention procedures. Questions regarding 'retainer and retention checks' were asked in Section E. Section F included questions on characteristics related to TRs and BRs and Section G requested participant information on specific treatment scenarios.

In addition, participants were invited to provide comments and further information at the end of the survey.

The online survey instrument, Survey Monkey (<http://www.surveymonkey.net>) was used to design the electronic (e-) survey. The ASO sent an email containing a link to the e-survey, on behalf of the researchers, to 502 ASO 'full members' in October 2018. Sending the email to 'full members' only aimed to include only those 'AHPRA registered' orthodontists in clinical practice whose principal workplace was in Australia. In February 2019, a reminder email was sent to ASO 'full members' requesting participation of those who had not responded. No further reminders were sent. Survey responses were exported to Predictive Analytics SoftWareH (PASWH) version 18 (SPSS Inc., IL, USA) for 'data cleaning' and statistical analyses. Descriptive analyses were expressed in frequencies and percentages. Cross-tabulation tables, Chi-square tests and Fisher's Exact Test were used to determine the differences between participant demographic information and retainer choice and between preferred retainer choice and prescribed practices. The level of statistical significance was set at $p < 0.05$.

Table I. Overview of participant demographic details.

		% Orthodontists
Region of main workplace	ACT/NSW	26.3
	Queensland	22.6
	SA/NT	15.4
	Victoria/Tasmania	27.1
	WA	8.6
Gender	Male	71
	Female	29
Origin of specialist qualification	Australia	86.4
	New Zealand	2.3
	UK	6
	Other	5.3
Practice setting	Private	84.5
	Community/hospital/university	4.9
	Community/hospital/university and private	10.6

Results

A total of 290 participants responded, giving an overall response rate of 58%. Responses from three participants were excluded from analysis as two were retired and the principal work location of one other was not in Australia. Not all participants answered all questions.

Table I provides an overview of participant demographic details regarding the region of main workplace, gender, origin of specialist qualification and practice setting. The mean number of years that participants have practiced as orthodontists was almost 16 (mean 15.57, standard deviation (SD) 11.04).

Table II shows that the TR was the most commonly chosen orthodontic retainer in the maxilla and the BR was most commonly chosen in the mandible. A combination of TR *and* BR/TR *and* BR in the maxilla and mandible was the most commonly chosen maxilla/mandible combination (23.3%).

An initial period of full-time (FT) wear of removable retainers (RR) was used by 37.7–48.3% of orthodontists, with 'night/sleeping with reducing frequency over time' being the most commonly used RR part-time (PT) wear practice recommended (Table III). In the mandible, an initial period of FT wear was significantly more likely to be advised by orthodontists when a RR only was prescribed compared to a RR *and* BR combination ($p = 0.04$). There were no other significant differences between

Table II. Most commonly used retainer in the maxilla and mandible following comprehensive orthodontic treatment by orthodontists.

Retainer	% orthodontists	
	Maxilla N=264	Mandible N=263
BR	20 (7.6%)	101 (38.5%)
TR	104 (39.4%)	58 (22.1%)
Hawley	40 (15.2%)	6 (2.3%)
BR and TR combined	80 (30.4%)	87 (33.2%)
BR and Hawley combined	10 (3.7%)	4 (1.5%)
Other	10 (3.7%)	7 (2.7%)

BR: bonded retainer. RR: removable retainer.

preferred RRs (with *and* without BRs) regarding an initial period of FT wear and PT wear practices ($p > 0.1$). FT varied from one day/night to 'indefinite' wear with the most common period of FT wear being three months (20.4–23.4%). Table IV shows that 25.6–72.8% of orthodontists used adjunctive retention practices as part of their retention regimen. The majority of orthodontists instructed their patients to wear their retainers indefinitely, with 85.3% recommending indefinite wear of RRs and 87.4% recommending indefinite wear of BRs. There was no significant difference between those who had worked as orthodontists for more than 16 years compared with those who had worked for a lesser period of time ($p > 0.2$).

Table III. Removable retainer wear practices by orthodontists.

RR wear practices	% Orthodontists
Maxilla: initial period of FT wear	
Yes	48.3
No	51.7
Maxilla: RR PT wear practices	
Night/sleeping indefinitely	26.5
Night/sleeping with reducing frequency over time	28.5
Other	45
Mandible: initial period of FT wear	
Yes	37.7
No	62.3
Mandible: RR PT wear practices	
Night/sleeping indefinitely	27.2
Night/sleeping with reducing frequency over time	33.1
Other	39.7

RR: removable retainer. FT: full-time. PT: part-time.

Table IV. Adjunctive retention procedures by orthodontists.

	CSF % Orthodontists	IPR % Orthodontists
Always	0	1.2
Mostly	0	4.4
Sometimes	7.2	27.3
Rarely	18.4	29.3
Never	74.4	37.8

CSF: circumferential supracrestal fiberotomy. IPR: interproximal reduction

Table V. Length of time following comprehensive orthodontic treatment in which retainer checks are carried out by orthodontists.

	RR % Orthodontists	br % Orthodontists
1 year after 'bands off'	12.1	9.3
2 years after 'bands off'	46.9	48
3-5 years after 'bands off'	12.9	14.1
Indefinitely	19.1	19.8
Other	9	8.2

Table VI. 'Happy for general dental practitioners to continue retainer checks' by orthodontists.

	Yes % Orthodontists	No % Orthodontists	Other % Orthodontists
RR	53.3	43.6	3.1
BR	66.4	28.9	4.7

RR: removable retainer. BR: bonded retainer

Table VII. Overview of thermoplastic retainer characteristics by orthodontist.

TR characteristic	% Orthodontists
Where fabricated	
Office lab	65.9
Commercial lab	34.1
Mode of fabrication	
Pressure forming	41.9
Vacuum forming	48.4
Don't know	9.7
Design	
Full occlusal coverage	99
Other	1
Material type	
Co-polyester	33.5
Polypropylene co-polymer or ethylene	45
Polyurethane	16.3
Other	5.2
Pre-fabrication thickness	
0.75 mm	26.3
1.0 mm	55.8
1.5 mm	4.4
Other	2.8
Don't know	10.8

TR: thermoplastic retainer

Three retainer reviews was the most common number of retainer checks among orthodontists in the first year following 'deband' (range 0–6, mean 2.71, SD 0.812). Table V shows that 'two years after bands off' was the most commonly adopted time frame by orthodontists for checking retainers. Most orthodontists were happy to allow GDPs to continue retainer checks (Table VI). Table VII provides an overview of TR characteristics and shows that vacuum forming is the most common mode of fabrication. Inadvertent activation of BRs was seen by 60.2% of orthodontists per year (Table VIII) and the 'pretreatment situation' was the factor that most influenced orthodontists' choice of retainer (Table IX). Table X shows orthodontist preferred retainer choices with specific treatment types. The BR was the choice (either on its own or combined with the TR) of 79% of orthodontists following diastema closure in the maxilla.

Table VIII. Overview of bonded retainer characteristics by orthodontists.

BR characteristic		% Orthodontists
Mode of fabrication	In your office lab on a cast of the patient's dentition	32.1
	In a commercial lab on a cast of the patient's dentition	34.2
	Directly at chairside	33.7
Design	<i>Maxilla</i>	
	Bonded 12-22 (bonded to 4 teeth)	48.8
	Bonded 13-23 (bonded to 6 teeth)	42.7
	Other	8.5
	<i>Mandible</i>	
	Bonded 33-43 (bonded to '3's only)	15.7
Material type	Bonded 33-43 (bonded to 6 teeth)	81.5
	Other	2.8
	SS single strand round	33.8
	Ortho Flextech™ SS or gold	26.2
	SS coaxial 5+1 round	12.9
	SS twisted 3 strand round	9.3
	SS braided 8 strand rectangular	4.8
	SS twisted 3 strand rectangular	4.4
Inadvertent BR activation per year	Other	8.6
	Never seen	39.8
	Seen 1-5 times	53.7
	Seen 5-10 times	4.4
	Seen 10-15 times	2.1

BR: bonded retainer SS: stainless steel

Discussion

This is the first comprehensive survey to identify retention practices of orthodontists in Australia since 2004.³ It also appears to be the first survey to determine, in detail, the characteristics of retainers prescribed by orthodontists in Australia. Response rates of 8–98% have been observed in international surveys.^{15,27} The response rate of 58%, in the current survey, mirrors the 58% response rate in the 2004 study and is greater than the 36% recorded in a 2013 survey that included some aspects of orthodontic retention in Australia.^{3,16}

The gender ratio (M/F: 71:29) was similar to that found in the UK, Ireland, Norway and Saudi Arabia and contrasts with the gender ratio (M/F: 84:16) in the 2013 survey.^{4,9,10,12,16} More recent surveys have shown a reduction in the 'gender gap' with two countries showing a majority response from female participants.^{11,13} The trends are likely to continue into the future as greater numbers of females enter postgraduate orthodontic training.

Table IX. Factors that influence treatment type by orthodontists.

Factor	% Orthodontists
Pretreatment situation	92.7
Oral hygiene status	69
Wish of patient	62.9
Periodontal issues	48.6
Wish of parent/guardian	47
End result	40
Interdigitation after treatment	31.8
Motivation	27.8
Age	27
Anatomy of teeth	15.5
Myofunctional aspects	9.4
Other	6.1
Third molars	5.3

Table X. Retainer choice after specific treatment types by orthodontist.

Treatment type	Retainer type			
	Maxilla		Mandible	
Extractions	1- TR + BR (42%)	2- TR only (33%)	1- TR + BR (45%)	2- BR only (24%)
Diastema closure	1- TR + BR (71%)	2- BR only (8%)	1- TR + BR (58%)	2- BR only (26%)
Expansion	1- Hawley only (31%)	2- TR + BR (30%)	1- TR + BR (43%)	2- BR only (23%)
Intrusion of anterior teeth	1- TR + BR (40%)	2- TR only (33%)	1- TR + BR (39%)	2- BR only (31%)
Extrusion of anterior teeth	1- TR + BR (48%)	2- TR only (26%)	1- TR + BR (42%)	2- BR only (31%)
Severe rotations – anterior teeth	1- TR + BR (63%)	2- TR only (13%)	1- TR + BR (58%)	2- BR only (28%)
Remaining overjet	1- TR + BR (40%)	2- TR only (26%)		
Adult patient	1- TR + BR (54%)	2- TR only (24%)	1- TR + BR (54%)	2- BR only (24%)
Impacted anterior tooth	1- TR + BR (48%)	2- TR only (27%)	1- TR + BR (45%)	2- BR only (29%)
Root resorption anterior teeth	1- TR + BR (47%)	2- TR only (25%)	1- TR + BR (42%)	2- BR only (31%)
Re-treatment	1- TR + BR (67%)	2- TR only (13%)	1- TR + BR (61%)	2- BR only (23%)

The popularity of TRs in the maxilla was similar to findings in the UK, Ireland, Malaysia and Saudi Arabia.^{4,9,12,28} Cost-effectiveness, patient preference and superior aesthetics have been suggested as reasons for the popularity of TRs.^{23,29-32} The ease of manufacture may have also contributed to their popularity and may have accounted for the high number of surveyed orthodontists who fabricated TRs in their own office laboratories (65.9%).²³ In addition, randomised controlled trials (RCTs) have shown TRs to be slightly more effective than Hawley retainers, and equally as effective as BRs, at holding orthodontic correction of the maxillary labial segment.^{33,34} Orthodontists have also found TRs quicker and easier to fit than BRs and believe that patients may be more compliant with prescribed TR wear compared with Hawley retainers.^{7,35}

The BR was the most frequently prescribed retainer in the mandible and this is consistent with findings in the majority of recently-surveyed countries.^{8,10,11,14,15,36} The choice of this retainer may result from findings that BRs are more effective than TRs in the maintenance of lower incisor alignment up to 48 months post-orthodontic treatment.^{34,37,38} In addition, patients prefer BRs compared to TRs and concerns regarding adverse periodontal outcomes seem to be unfounded up to four years post ‘deband’.^{31,34,38-40}

Most orthodontists prescribed an initial period of FT wear of RRs. This is similar to findings in many other countries.^{6,9,14,15} It is at variance with current evidence that indicates PT wear of RRs, without an initial period of FT wear, is sufficient in maintaining orthodontic treatment results.⁴¹⁻⁴⁴

When a RR only was the prescribed retainer in the mandible, an initial period of FT wear was significantly more likely to be advised compared to those who prescribed a RR *and* BR in combination. This may reflect uncertainty between orthodontists regarding the effectiveness of a RR only in maintaining mandibular incisor alignment in the immediate post ‘deband’ period.

CSF was carried out by 7.2–18.4% of orthodontists in the presented survey. This compares to its use by 19.1–30% of orthodontists surveyed in Turkey and Saudi Arabia.^{11,12} There is limited evidence to suggest that CSF may reduce relapse of severely rotated teeth in the maxilla in the short term.²⁰ More research is required, however, to determine those pretreatment situations in which CSF can be most effective and whether the benefit of CSF can be maintained over the long term before CSF is adopted as a routine practice.

IPR was used as an adjunctive retention practice by up to 62.2% of surveyed orthodontists, which is greater than its use by orthodontists in Turkey (30%).¹¹ Two RCTs have shown that IPR alone, without the use of a retainer, can be effective in maintaining lower incisor alignment after orthodontic treatment.^{21,45} Subjects were followed up for up to five years after ‘deband’ and IPR involved ‘stripping’ as much as 5 mm of enamel in subjects over the observation period. Further investigation may be necessary to identify those patients who would benefit most from IPR (an invasive and irreversible procedure) and whether wearing a retainer in conjunction with IPR would be more appropriate.

Indefinite wear of retainers was recommended by 85.3–87.4% of respondents. This is greater than the 66% rate recorded in the 2004 Australian survey and the 68% in the 2013 Australian orthodontic practices' survey.^{3,16} It reflects the trend seen elsewhere towards a greater proportion of orthodontists prescribing indefinite retention. Interestingly, there was no difference between those participants who had worked as orthodontists for more than 16 years (the mean number of years that participants had worked as orthodontists 'rounded up' to the nearest whole number) and those who had worked for a lesser period. This may reflect a widespread acceptance that age-related changes in occlusion and alignment occur regardless of whether or not individuals have had orthodontic treatment.^{17,23}

Three retainer checks was the most common number of retainer reviews that orthodontists undertook during the first year following 'deband'. This is consistent with findings in other countries, where the majority of orthodontists carried out two to four retainer checks in the first year, which would appear to be a reasonable schedule.^{5,8,9,14,15,46}

Less than 20% of orthodontists see their patients for 'retainer checks' over an indefinite period following comprehensive orthodontic treatment. This compares, however, with 28.9–43.6% of orthodontists who are not happy for GDPs to manage RR and BR checks. Greater GDP education and improved communication between orthodontist and GDP were suggestions made by participants in the present survey that may help remove this 'disconnect'. The management of a patient's orthodontic retention and retainers in the long term should be discussed at the beginning of treatment and be part of the valid consent process.⁴⁷ There should also be greater communication between the orthodontist and the GDP to determine the responsibilities of each in the ongoing management of the patient's orthodontic retention.^{17,46}

In the presented survey, the most commonly-used TR sheet 'pre-fabrication thickness' was 1.0 mm, which is similar to findings in Ireland and India.^{9,36} A wide variety of 'pre-fabrication thicknesses' have been in used in clinical research, however, and there appears to be no agreement on optimal TR thickness.^{33,34,37,38,41,44,45,48} A recent study has indicated that 1.0 mm TR 'pre-fabrication' thickness shows a significantly lower failure rate than 0.75 mm.²⁴

There appears to be little information regarding TR material and the mode of manufacture available from

other national surveys. The most commonly used TR material in Australia was polypropylene/ethylene copolymers (for example, Essix C+™). This may be due to the perceived greater durability and flexibility associated with this material type compared with the 'more aesthetic' polyethylene polymers.⁴⁹

Vacuum forming was the mode of TR manufacture used by 48.4% of respondents in this survey. Its popularity may be due to the relative ease in its manufacture compared with pressure-forming.²³

Further research is required, however, to establish the most effective TR 'pre-fabrication' thickness, material type and mode of manufacture over the short and long term.²³

The majority of orthodontists in Australia fabricate their BR directly at chairside or indirectly within the office lab on a 'cast' of the patient's dentition. This is similar to findings from a Norwegian survey and may be due to the relative ease of the BR's fabrication.¹⁰

The most common BR design in the maxilla involved bonding to the four incisors only. This differs from the 2004 Australian study in which the most common BR design was bonding to all six maxillary anterior teeth.³ It is similar, however, to the preferred maxillary BR design by orthodontists in New Zealand and Lithuania.^{13,15} Concern regarding increased BR failure when canines are included may explain the rationale behind bonding only to the maxillary incisors.^{17,50}

The most common BR design in the mandible, however, involves bonding to all four incisors *and* the two canines. This is similar to the most popular BR choice by orthodontists in the Netherlands, Switzerland, Norway and Lithuania.^{8,10,13,14} The most popular BR design in the 2004 Australian study involved bonding to the canines only.³ Orthodontists may perceive that bonding the BR to all six mandibular anterior teeth may be more effective at maintaining incisor alignment than BRs that are bonded only to the canines.¹⁸

Stainless steel (SS), single strand, round wire was the most common BR material type chosen by 33.1% of orthodontists in Australia. This is greater than the 16.1% and 4.4% of orthodontists in New Zealand and the Netherlands, respectively, who chose SS single strand round wire.^{14,15} The wide variety of material types preferred by orthodontists in this and other surveys indicates a need for further research to determine the optimum BR material type.^{8,17} The BR type recommended by Zachrisson (a round SS coaxial

wire) was chosen by 12.1% of orthodontists presented in the current survey.⁵¹

Inadvertent BR activation may result in undesirable tooth movement. That is, movement of tooth/teeth beyond the 'normal relapse' seen with detachment of the BR from one or more teeth, or complete BR breakage.⁵² It may be due to 'activation' of the BR if the BR is not attached passively or if the BR wire is distorted through, for example, masticatory forces.^{14,17} In the present survey, over 60% of orthodontists per year have seen inadvertent BR activation. This compares with between 56.7 and 94.7% of orthodontists who have seen inadvertent BR activation in Switzerland, New Zealand and the Netherlands.^{8,14,15} A clinical practice guideline for orthodontic retention has been published recently.⁴⁶ The lack of available high quality evidence related to orthodontic retention means that its recommendations are mainly based on expert opinion. The authors suggest that, in general, square or rectangular SS wire is bonded to all six anterior teeth in the maxilla and mandible. High quality research, however, is required to determine the aetiology of inadvertent activation and the identification of specific BR material properties that may be associated with this unwanted occurrence.

The 'pretreatment situation' was the factor that most influenced orthodontists' retainer choice. This mirrors findings from surveys in other countries and illustrates the importance of tailoring retention practices to the individual patient.^{5,8-10,23,46} 'Patient wishes' was a factor that influenced 62.9% of orthodontists' choice of retainer. This is significantly greater than the 3% recorded in the 2009 survey in the Netherlands and may reflect the increasing importance that 'patient opinion' plays in the provision of optimal evidence-based healthcare.^{17,23,46,53}

The wide variety of specific treatment types in which the combination of BR *and* TR was the most popular retainer suggests that this could be the preferred retainer in the future. Interestingly, the most commonly chosen maxilla/mandible combination by the currently surveyed orthodontists was the application of a TR *and* BR/TR *and* BR. This 'dual retention' may be useful in minimising some of the limitations of each retainer type.^{9,17,18}

The Hawley retainer was the most commonly chosen retainer for retention of expansion in the maxilla, which was similar to findings reported by orthodontists in the UK and Ireland.^{4,9} A modification in TR design

that increases TR rigidity has been described and may result in less requirement of the Hawley retainer for this malocclusion trait in the future.²³

The strengths of the present study include pre-piloting and piloting of the survey prior to the study to ensure its validity and acceptability to Australian orthodontists as well as establishing the time taken to answer the questions. In addition, the use of aspects of similar surveys facilitated a closer comparison with previous reports.

The present study had several limitations. A balance between the length and detail of the survey was necessary to ensure optimum response.⁹ Additional questioning may have provided further information but may have reduced the number of responses. The response rate was acceptable but adding a postal option for participants may have increased the response rate.⁵⁴

This present survey provides an update on orthodontic retention practices in Australia. It enables a comparison with the results of a previous survey on Australian retention practices published in 2004, and with similar surveys carried out in other countries. Data from this survey provide information for future related studies and shows the need for high quality research on which to base retention practices and retainer design, material and mode of fabrication.

Conclusions

- TRs were the most common retainer choice in the maxilla and BRs were the most common choice in the mandible reported by orthodontists in Australia.
- Retention practices and retainer characteristics varied considerably between orthodontists.
- Lifetime retention was favoured by the majority.
- A significant minority of orthodontists were 'not happy' for GDPs to monitor retention and greater communication between orthodontists and GDPs is required to effectively manage retention over the long term.

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