Measuring Beliefs about Orthodontic Treatment: A Questionnaire Approach

M. Elizabeth Bennett, PhD; Christine Michaels, MA, DMD; Kevin O'Brien, MSc, BDS, FDS, DOrth; Robert Weyant, DMD, DrPH; Ceib Phillips, MPH, PhD; Katherine Dryland Vig, BDS, MS, FDS, DOrth

Abstract

Objectives: *Few studies have examined what parents and orthodontists expect from and value about orthodontic treatment. In this study, we designed and tested a questionnaire to outline what drives consumer demand for children's orthodontic care. Further, we present data from the questionnaire to illustrate how expectations and values pertaining to orthodontic treatment relate to sociodemographic variables.* ***Methods:*** *Subjects were 220 Pennsylvania orthodontists and 220 parents at a university orthodontic clinic who were administered a questionnaire designed to assess what parents and orthodontists value about and expect from orthodontic treatment. Items for the questionnaire were developed via a qualitative, telephone interview process. Data were analyzed using factor analysis and reliability analysis for scale development, and analysis of variance for preliminary validity assessment.* ***Results:*** *Through factor analysis, the questionnaire was reduced from 84 to 52 items, and eight scales were examined: expected treatment benefits, expected treatment risks (short- and long-term), expected treatment inconveniences, value of treatment benefits, value of risks (short- and long-term), and value of treatment inconveniences. For parents, the reliability for all scales was in the acceptable range. For orthodontists, only the "short-term risks" scale failed to attain an acceptable reliability. Preliminary validity was assessed through examining relationships between demographic variables and subscale scores. For parents, income, father's education level, and sex of respondent were related to treatment expectations and values. For orthodontists, age, sex, and patient volume were related to treatment values.* ***Conclusions:*** *The questionnaire developed in the present study was found to be practical and reliable for use with providers and consumers of orthodontic care and can be used to explore factors affecting the demand for orthodontic care. Implications of possible unrealistic treatment expectations on the part of orthodontists and parents also are discussed. [J Public Health Dent 1997;57(4):215-23]*

Key Words: orthodontics, treatment risks/benefits, questionnaire, reliability, factor analysis.

Millions of parents throughout the world seek orthodontic treatment for their children; yet surprisingly little is known about the reasons this care is sought. Although esthetic improvement is the most common reason for seeking orthodontic treatment (1,2), little is known about how esthetic changes in tooth alignment translate into tangible patient benefits. Furthermore, parents seeking esthetic improvements for their children presumably have many options available. Rhinoplasty, liposuction, or implants might provide esthetic improvement; however, relatively few parents seek these treatments for their children. While functional improvements are another possible motivation for parents to seek orthodontic treatment for children, the majority of orthodontic treatment is carried out on children whose malocclusions are unlikely to produce functional deficits (i.e., inability to chew or speak) if left untreated (3-7). Thus, it remains unclear why parents so commonly choose orthodontic treatment for their children.

While several studies have explored the factors that predict the desire for orthodontic treatment, few have asked parents directly what they expect from and value about orthodontic treatment. For example, Albino et al. (8) found that the strongest predictor of orthodontic treatment uptake was occlusal status. That is, a group of adolescents about to begin orthodontic treatment had overall poorer occlusal index scores than did a group of adolescents who were not seeking orthodontic treatment. Shaw (9) reported a similar finding in a sample of Welsh schoolchildren. Like Albino's American sample, Shaw found that while some children with severe occlusal problems were satisfied with their dental appearance, an examination of overall group differences revealed that visible occlusal irregularity was the biggest predictor for desire for orthodontic treatment. One study of American and Welsh families (10) asked a few direct questions about expectations of orthodontic treatment. Parents and their children were asked about treatment expectations with regard to facial change, expected dental health benefits, social benefits, and career advantages. They found that, in general, parents and children expected orthodontic treatment to provide an advantage occupationally and socially, as well as to improve dental health. A substantial proportion expected functional (chewing and speaking) improvements and profile changes. We were unable to locate any study exploring a comprehensive list of what parents might expect from orthodontic treatment, nor could we locate a study that systematically explored what parents value about orthodontic treatment.

To understand more specifically why parents are willing to incur sig-

Send correspondence and reprint requests to Dr. Bennett, Department of Orthodontics, University of North Carolina, CB #7450, Chapel Hill, NC 27599-7450. E-mail: bbennett@intercenter.net. Dr. Michaels is affiliated with Orthodontic Centers of America; Dr. O'Brien is with Turner Dental School, Manchester, UK; Dr. Weyant is with the University of Pittsburgh; Dr. Phillips is with the University of North Carolina; and Dr. Vig is with Ohio State University. Manuscript received: 6/27/95; returned to authors for revision: 12/20/95; accepted for publication: 4/24/97.

nificant out-of-pocket costs for their children's orthodontic treatment, we designed and tested a questionnaire to assess parents' views of the risks and benefits of orthodontic treatment and the value they place on both negative and positive outcomes of treatment. Further, we examined the questionnaire responses relative to sociodemographic variables. In so doing, we believe we can begin not only to characterize the factors driving consumer demand for treatment, but also to understand what factors lead to consumer satisfaction with care. Arguably, satisfaction with care results when prior expectations are realized after treatment. Conversely, if expectations are unrealistic, subsequent satisfaction with treatment is unlikely (11).

Methods

The study was conducted in two phases. The first consisted of a qualitative assessment of parents' and orthodontists' thoughts and concerns about orthodontic treatment. The results of this assessment were used to generate "closed-ended" items for the second phase of the study. The second phase involved distribution of the questionnaire resulting from phase I to a sample of parents of prospective orthodontic patients and a sample of orthodontists.

Phase 1: Item Generation. In this phase of questionnaire development, we contacted two groups. First, we telephoned parents who had sought an initial orthodontic evaluation for their children (aged 18 years and younger) at the University of Pittsburgh orthodontic clinic. We asked open-ended questions concerning their views of the benefits and risks of orthodontic treatment for their child (12). The structure of the interview was similar to "one-on-one" focused interviews used in market research to generate ideas and opinions of consumer groups (13). If a parent did not understand a question, a brief explanation was given; however, to avoid leading respondents, no examples were used to explain questions. Limited demographic information was gathered from respondents, including educational level of parent, sex of parent, age of parent, and number of family members who were in or had been in orthodontic treatment. If parents had questions about orthodontics, the question was noted and addressed after the interview.

The interviewers recorded responses verbatim, and interview content was continually reviewed as a means of assessing whether new information was being gathered in each consecutive interview. By the eighth parent interview, a review of responses revealed that we were receiving redundant information. We stopped initiating interviews after 15 had been completed because no new information had been collected after the eighth interview (13,14).

A similarly structured interview process was conducted on a randomly selected group of Pennsylvania-licensed orthodontists drawn from a state directory of orthodontists. Limited demographic information was gathered from the orthodontists, including age, sex, and number of years in practice. The continual review of responses revealed that by the sixth interview, we were getting redundant information. We stopped at 15 interviews (to be consistent with the number of parent interviews), and gained no information that was not present in the first five interviews.

The responses of the 15 parents and the 15 orthodontists were pooled and transformed into statements. These statements were then sorted into categories and redundant responses were eliminated. This approach resulted in a combined parent and orthodontist response list containing 44 statements. Two items were repeated in reverse form for reliability checks, resulting in 42 unique items.

Following the methods outlined by Ronis et al. (15), these 44 statements were coupled with six-point Likert scales assessing the likelihood that the outcome would occur and the desirability/undesirability or importance of that same outcome. Specifically, respondents were asked to rate how likely each of the 44 outcomes was by choosing a point on a six-point Likert scale anchored at extremely unlikely (a 1 on the scale) and extremely likely (a 6 on the scale). Next, respondents were asked to make value assessments on each of the 44 outcomes by rating how undesirable/desirable (in the case of "bad" outcomes) or how important (in the case of "good" outcomes) each of the 44 items were. Different response scales (desirable/undesirable vs important) for value assessments were necessary to avoid introducing unwanted error variance. For example, assuming that parents and orthodontists see pain after appointments as a negative event and offering only responses that reflect this (e.g., ranging from a little bad to very bad) might prevent respondents from expressing their opinions accurately, thus introducing error into those items. Indeed, some orthodontists report that pain after appointments can be a positive event, serving as a reminder to avoid "forbidden foods" such as chewy candies and gum.

We anchored the Likert scale for all "benefit" items at "extremely important" (a 6 on the scale) and "not at all important" (a 1 on the scale). Thus, every orthodontic "benefit" was paired with two response scales (how likely and how important). Conversely, we took a "full range" approach to treatment risks, and gave respondents the opportunity to choose options ranging from "very desirable" (a 6 on the scale) to "very undesirable" (a 1 on the scale). Thus, every orthodontic "risk" was paired with two responses (how likely and how desirable/undesirable). Overall, the questionnaire consisted of two parts, one in which respondents assessed the likelihood of treatment outcomes (likelihood assessments) and one in which the desirability/importance of those same outcomes (value assessments) was assessed.

The questionnaire was tested on five parents of orthodontic patients and five orthodontists. Items were reworded to improve readability and comprehension. Two final versions of the questionnaire were created: one for orthodontists and the other for parents. The orthodontist form asked orthodontists to make likelihood assessments and value assessments based on "a child" in orthodontic treatment. Parents were asked to make likelihood assessments and value assessments based on their own child. While this approach does not allow for direct comparisons between results from orthodontists and those from parents (they are rating different entities), the factor structure of the items between the two groups can be compared.

Phase 2: Questionnaire Distribution. The orthodontic form of the questionnaire was sent to 373 orthodontists (every licensed orthodontist in Pennsylvania according to the 1989 "World

Directory of Orthodontists") using the Dillman (16) method for maximizing response rate. A total of 129 questionnaires were returned after the first mailing (34.6%). Repeat mailings were sent at three weeks and six weeks following the first mailing; the final response rate was 54.2 percent (220 questionnaires total).

Initially, the parent questionnaire was included in the School of Dental Medicine screening appointment information mailer (along with a map to the clinic and general appointment information). In the cover letter, parents were instructed to bring their completed questionnaire to the screening appointment. Parents who did not bring a completed questionnaire to the appointment were asked to complete the questionnaire while their child was being examined. Because of the extremely high failure/cancellation rate for screening appointments in the first month, we discontinued mailing of the questionnaire, and began consecutively distributing the questionnaire to each parent of a child who was being screened. No parent refused to complete a questionnaire, and questionnaires were distributed to 220 consecutive parents between October 1993 and March 1994. Every parent completed the questionnaire before receiving specific information about their child's orthodontic condition.

In addition to questionnaire data, we collected some descriptive information on the parents, including their income level, educational level, prior experience with orthodontic care, age, and sex. For orthodontists, we collected information on hours of patient contact per week, number of patients seen per week, years in practice, and sex.

Analysis Strategy. Data were entered using D-Base IV, and translated for use in SPSS-X-PC. Data from the likelihood assessments (items 1–44, minus two repeat items) were factor analyzed using principal components analysis with a varimax rotation. Criteria for factor retention included an eigenvalue greater than 1, and percent variance approximately 5 or greater. Because gathering information about likelihood assessments was more straightforward than gathering information about value assessments (i.e., scale anchors remained consistent throughout likelihood assessments, but were variable in value assessments), we chose to factor analyze likelihood assessments only. We applied the resultant subscales to both likelihood assessments and value assessments. Furthermore, because of the vast differences in knowledge level between orthodontists and parents, their data were analyzed separately. When divided this way, both data sets (orthodontist and parent) had a cases-to-item ratio of 5:1, which is in the acceptable range for factor

TABLE 1
Characteristics of Parent Sample

Variable	% Yes	% No	% Missing
Female respondent	78.2	16.4	5.5
Female patient	51.8	35.0	13.2
Any dental insurance	55.0	40.5	4.5
Respondent had ortho	22.7	72.3	5.0
Other parent had ortho	10.5	56.4	33.2
Income over $30,000	30.9	57.7	11.4
Father some college or more	29.1	59.5	11.4
Mother some college or more	25.0	65.5	9.5

TABLE 2
Items, Means, and Standard Deviations for Parent Factors 1–4: Assessing Likelihoods

Factor	Items	Mean	SD
1: Benefits	Better bite	5.04	1.01
	Better smile	5.03	1.03
	Look better	4.98	.89
	Straighter teeth	4.97	.88
	Better-looking teeth	4.97	.90
	Pleased with looks	4.95	.83
	More attractive profile	4.55	1.07
	Easier to brush	4.42	1.07
	Teeth straight forever*	4.36	.95
	Increased self-esteem	4.26	1.11
2: Long-term risks	Stains on teeth	2.77	.95
	Injury to teeth	2.53	.86
	Gum disease	2.50	.93
	Damage to roots	2.42	.85
	More cavities	2.41	1.00
	Damage to bones	2.39	.86
3: Short-term risks	Change foods*	3.87	1.16
	Sores or cuts in mouth during treatment*	3.54	.97
	Pain during appointments*	3.53	1.02
	Pain after appointments*	3.38	.99
	Swollen gums during treatment	3.38	.99
	Break a piece of braces	3.05	1.02
4: Inconvenience	Time-consuming for parent	3.37	1.15
	Inconvenient for parent	3.10	1.20
	Scheduling appointments difficult	3.04	1.13
	Miss too much school	2.94	1.14

*Items noted with asterisk were not persent in orthodontists' factor solution.

analysis (17, 18). Reliability was assessed using Chronbach's alpha.

In addition, we used analysis of variance to assess preliminary validity of the resultant subscales. ANOVA was used to explore the relationships between each of the subscales and selected demographic variables for both the parents and orthodontists. Use of ANOVA also enabled us to explore any significant interaction effects.

Results

Characteristics of Samples. *Parents.* On average, respondents were 38.3 years old (SD=6.4) and their spouses averaged 49.6 years (SD=5.9). Parents averaged 2.3 (SD=1.0) children and drove an average of 17.9 (SD=18.5) miles to the orthodontic clinic. The child for whom the parent was seeking treatment was on average 13.0 years old (SD=4.2). Additional parent demographics are given in Table 1.

Orthodontists. Orthodontists were 49.4 years old on average (SD=10.7), had been in practice an average of 19.4 years (SD=10.4), and had an average of 32 patient contact hours per week (SD=8.3). Only 9.1 percent were women, and 72.6 percent reported treating over 100 patients per week.

Factor Analyses. The initial goal was to winnow the 42-item pool (44 items minus two repeat items) down to a more manageable set of items that would assess parents' and orthodontists' beliefs about the benefits and risks of orthodontic treatment.

Results of the factor analysis for parents yielded four main factors that together accounted for 45.5 percent of the variance. A "benefits" factor (factor 1, with an eigenvalue of 9.1, accounting for 20.7% of the variance), a "long-term risks" factor (factor 2, with an eigenvalue of 5.3, accounting for 12% of the variance), a "short-term risks" factor (factor 3, with an eigenvalue of 3.7, accounting for 8.4% of the variance), and an "inconvenience" factor (factor 4, with an eigenvalue of 2.0, accounting for 4.4% of the variance) emerged. Eight other factors with eigenvalues above 1 are not reported here because they each consisted of too few items for meaningful interpretation and did not meet our factor retention criteria. Items in factors that were not retained were dropped from subsequent analysis. Items included in each factor are listed in Table 2.

Results of the factor analysis for orthodontists yielded four main factors, which together accounted for 39.4 percent of the variance. A "benefits" factor (factor 1, with an eigenvalue of 8.3, accounting for 18.8% of the variance), a "long-term risks" factor (factor 2, with an eigenvalue of 4.2, accounting for 9.5% of the variance), an "inconvenience" factor (factor 3, with an eigenvalue of 2.7, accounting for 6.2% of the variance), and a "short-term risks" factor (factor 4, with an eigenvalue of 2.1, accounting for 4.9% of the variance) emerged. Eight other factors with eigenvalues above 1 are not reported here because they could not be

TABLE 3
Items, Means, and Standard Deviations for Orthodontist Factors 1–4: Assessing Likelihoods

Factor	Item	Mean	SD
1: Benefits	Better smile	5.57	.72
	Teeth easy to brush	5.51	.79
	Better bite	5.47	.74
	Look better	5.42	.71
	Straighter teeth	5.42	.71
	Better-looking teeth	5.33	.78
	Pleased with looks	5.22	.75
	Increased self-esteem	4.80	.84
	More attractive profile	4.76	.92
2: Long-term risks	More dental health problems*	2.77	.93
	Damage to roots	2.53	.94
	Gum disease	2.38	1.04
	Stains on teeth	2.37	.86
	Miss too much school*	2.28	.96
	Damage to bones	2.20	.96
	Increased cavities*	2.15	.89
	Injury to teeth	1.94	1.01
	Lower grades*	1.64	1.00
3: Short-term risks	Break piece of braces	4.25	1.02
	Pain after appointments	3.84	.85
4: Inconvenience	Inconvenience for parent	3.51	.91
	Time constraining for parent	3.38	.98
	Scheduling appointments difficult	3.24	.94

*Items noted with asterisk were not present in parent factor structure.

TABLE 4
Internal Consistencies: Estimating Likelihoods and Value Assessments Using Parent Factor Solution

Subscale	Alpha (Parents)	Alpha (Orthodontists)
Benefit likelihood	.89	.85
Long-term risks	.87	.80
Short-term risks	.80	.69
Inconvenience	.86	.71
Benefit value	.87	.87
Long-term risk value	.94	.88
Short-term risk value	.81	.61
Inconvenience value	.85	.83

TABLE 5
Average Ratings for Likelihood Estimates and Value Assessments

	Parents		Orthodontists	
Subscale	Mean	SD	Mean	SD
Benefit likelihood	4.8	.7	5.0	.6
Long-term risks	3.5	.7	4.1	.6
Short-term risks	2.5	.7	2.3	.7
Inconvenience	3.1	1.0	3.1	.7
Benefit value	5.1	.2	5.3	.5
Long-term risk value	2.7	.7	2.6	.5
Short-term risk value	1.9	.8	1.5	.5
Inconvenience value	2.8	.7	2.5	.6

TABLE 6
Percent Frequency Distribution for Selected Items (Parents and Orthodontists)

Variable	Consumer	Orthodontist
Fewer dental problems		
Extremely unlikely	2.4	1.4
Very unlikely	3.3	5.0
Unlikely	26.2	22.8
Likely	51.9	47.5
Very likely	13.3	21.0
Extremely likely	2.9	2.3
More outgoing		
Extremely unlikely	5.1	0.5
Very unlikely	4.2	0.9
Unlikely	36.4	9.6
Likely	30.8	41.7
Very likely	13.6	40.4
Extremely likely	9.8	6.9
Teeth easier to brush		
Extremely unlikely	0.0	0.5
Very unlikely	1.9	0.0
Unlikely	18.6	3.2
Likely	36.3	21.4
Very likely	22.3	42.3
Extremely likely	20.9	32.7
Improved self-esteem		
Extremely unlikely	2.3	0.5
Very unlikely	1.4	0.9
Unlikely	17.5	2.7
Likely	42.4	29.1
Very likely	19.8	48.2
Extremely likely	16.6	18.6
Fewer cavities		
Extremely unlikely	1.4	2.8
Very unlikely	5.2	2.8
Unlikely	42.4	23.4
Likely	36.7	39.4
Very likely	10.0	26.6
Extremely likely	4.3	5.0

meaningfully interpreted and did not meet our factor retention criteria. Items in factors that were not retained were dropped from subsequent analysis. Items included in each factor are listed in Table 3.

Even with the assumed differences in knowledge level between parents and orthodontists, the factor structures of the two groups are quite similar. Using the parent factor solution as a guide, any item not present in both solutions is noted with an asterisk in Tables 2 and 3.

Reliability and Descriptives. Because the final questionnaire would likely be used in the future for consumers of orthodontic treatment, we used the parent factor structure for computing subscales of the items assessing likelihoods. We applied the same factor structure to items assessing the value of outcomes. Subscales were created from each factor by averaging the items in each factor, i.e., a scaled mean (SM) was computed for each factor. The internal consistency of each subscale (likelihood assessments and value assessments) was computed using Chronbach's alpha (Table 4). For the parent group and orthodontic group, values ranged from .61 to .94.

Means and standard deviations computed for the parent and orthodontic subscales (Table 5) suggested that both parents and orthodontists felt that benefits of treatment were most likely to occur, and that the benefits of orthodontic treatment were most highly valued. Furthermore, examination of the frequencies from long-term and short-term risks suggested that providing a full-range of response items was necessary, especially for short-term risks of treatment. In several "short-term risk" items, many respondents felt that the risk would actually be "desirable." For example, 60 percent of parents felt it was "desirable" or "very desirable" that their child would have to change the foods eaten while in orthodontic treatment.

In addition to examining the factor structure of the items, we also examined individual items to see if parents' and orthodontists' expectations of orthodontic benefits are consistent with current orthodontic research. Examination of five such items (three "dental health items" and two "self-concept" items) revealed that both parents and

TABLE 7
Relationships Between Selected Demographic Variables and Likelihood Assessments: Parents

	Likelihood of Benefits			Likelihood of Short-term Risks			Likelihood of Long-term risks			Likelihood of Inconvenience		
Variables	Scaled Mean	*n*	*P*-value	Scaled Mean	*n*	*P*-value	Scaled Mean	*n*	*P*-value	Scaled Mean	*n*	*P*-value
Income												
Under $30,000	4.86	100	.052	3.47	99	.058	2.53	101	.826	2.95	106	.032
Over $30,000	4.64	63		3.63	64		2.39	66		3.27	66	
Father's education												
≤12 years	4.78	110	.653	3.55	109	.752	3.60	109	.012	3.06	114	.919
> 12 years	4.77	53		3.50	54		2.24	58		3.09	58	
Respondent ortho												
Yes	4.91	39	.184	3.38	39	.176	2.38	41	.577	2.89	40	.178
No	4.73	124		3.58	124		2.51	126		3.13	132	
Respondent sex												
Male	4.69	33	.551	3.24	33	.005	2.20	35	.026	2.93	34	.248
Female	4.80	130		3.61	130		2.55	132		3.11	138	

TABLE 8
Relationships Between Selected Demographic Variables and Value Assessments: Parents

	Value of Benefits			Value of Short-term Risks			Value of Long-term Risks			Value of Inconvenience		
Variables	Scaled Mean	*n*	*P*-value	Scaled Mean	*n*	*P*-value	Scaled Mean	*n*	*P*-value	Scaled Mean	*n*	*P*-value
Income												
Under $30,000	5.25	102	.072	2.74	85	.805	1.95	95	.525	2.80	89	.591
Over $30,000	4.99	65		2.70	60		1.79	62		2.84	61	
Father's education												
≤12 years	5.21	107	.660	2.75	92	.480	1.96	99	.267	2.84	93	.616
> 12 years	5.05	60		2.69	53		1.76	58		2.79	57	
Respondent ortho												
Yes	5.21	41	.412	2.83	38	.202	1.92	40	.642	2.78	39	.695
No	5.13	126		2.69	107		1.88	117		2.83	111	
Respondent sex												
Male	4.81	35	.002	2.77	33	.581	1.77	.34	.507	2.77	34	.659
Feale	5.24	132		2.71	112		1.92	123		2.83	116	

orthodontists have expectations of the benefits of orthodontic treatment that are not supported by current research findings in orthodontics (Table 6). For example, a large majority of both parents and orthodontists estimated that orthodontic treatment would result in fewer dental health problems. Similarly, both groups estimated that teeth would be easier to brush and fewer cavities would occur after orthodontic treatment. Orthodontists and parents also expected considerable "self-concept" benefits, including an increase in self-esteem and increased social ease.

Relationships of Scales to Sociodemographic Factors. *Parents.* Analysis of variance was used to assess whether the average responses for likelihood assessments and value assessments were affected by sociodemographic groupings based on income, father's education, respondent's orthodontic history, and respondent sex (Tables 7 and 8). Because only one significant interaction emerged from this analysis, only main effects are reported in tabular form. Analysis of variance by income (family income above vs below $30K) showed statistically significant group mean differences on the likelihood of parental inconvenience (P=.032). Overall, respondents with incomes above $30K expected more parental inconvenience (scaled mean=3.27) than did respondents with incomes under $30K (SM=2.95). Father's education (high school or less vs more than high school) showed statistically significant group mean differences on the likelihood of long-term risks. Overall, respondents where the

TABLE 9
Relationships Between Selected Demographic Variables and Likelihood Assessments: Orthodontists

Variable	Likelihood of Benefits			Likelihood of Short-term Risks			Likelihood of Long-term Risks			Likelihood of Inconvenience		
	Scaled Mean	*n*	*P*-value	Scaled Mean	*n*	*P*-value	Scaled Mean	*n*	*P*-value	Scaled Mean	*n*	*P*-value
Orthodontist age												
≤48 years	5.04	100	.461	4.18	102	.001	2.26	99	.778	3.04	101	.175
≥49 years	5.04	106		3.93	106		2.25	107		3.18	107	
Patients seen/week												
≤100	4.87	49	.007	3.91	51	.077	2.39	50	.108	3.05	51	.480
≥101	5.09	157		4.09	157		2.21	156		3.13	157	
Orthodontist sex												
Male	5.02	188	.032	4.05	188	.379	2.25	187	.722	3.12	188	.882
Female	5.22	18		4.02	20		2.25	19		3.01	20	

TABLE 10
Relationships Between Selected Demographic Variables and Value Assessments: Orthodontists

Variable	Value of Benefits			Value of Short-term Risks			Value of Long-term Risks			Value of Inconvenience		
	Scaled Mean	*n*	P-value	Scaled Mean	*n*	P-value	Scaled Mean	*n*	P-value	Scaled Mean	*n*	P-value
Orthodontist age												
≤48 years	5.26	100	.272	2.66	101	.199	1.44	102	.448	2.47	102	.862
≥49 years	5.30	103		2.57	105		1.52	102		2.46	102	
Patients seen/week												
≤100	5.25	51	.721	2.68	50	.341	1.55	49	.242	2.48	49	.630
≥101	5.29	152		2.59	156		1.46	155		2.46	155	
Orthodontist sex												
Male	5.27	183	.139	2.60	186	.824	1.49	184	.410	2.47	184	.715
Female	5.39	20		2.70	20		1.38	20		2.42	20	

male head-of-household had better than a high school education expected fewer long-term risks of treatment (scaled mean=2.24) compared to those with lesser education (scaled mean= 3.60). Statistically significant group mean differences were found between men and women on the likelihood of short-term and long-term risks and the value of treatment benefits. Women respondents rated short-term (scaled mean=3.61) and long-term (scaled mean=2.55) risks as more likely than male respondents (short-term risk scaled mean=3.24; long-term risk scaled mean=2.20). No significant group mean differences were found for orthodontic history of the respondent.

A single interaction effect, for value placed on treatment benefits, occurred between income level and father's education (P=.040). It suggests that for families with income over $30K per year, those with more educated fathers (more than high school) placed greater value on the benefits of orthodontic treatment (scaled mean=4.88 for fathers with less education to scaled mean = 5.09 for fathers with more education). Conversely, for families with income under $30K per year, those with more educated fathers placed a lower value on the benefits of orthodontic treatment (scaled mean=5.33 for fathers with less education to scaled mean=5.00 for fathers with more education).

Orthodontists. Analysis of variance was used to assess whether the average responses for likelihood assessments and value assessments were affected by practice or demographic groupings based on orthodontist age and patient volume (Tables 9 and 10). Results are not presented for sex-based comparisons because the number of women orthodontists was too small (n=20) for meaningful comparisons. Significant group mean differences between older and younger orthodontists (≤48 years vs ≥49 years) were found on the likelihood of short-term risks. Younger orthodontists (scaled mean=4.18) expected more short-term risks of treatment compared to older orthodontists (scaled mean=3.93). Differences between those treating 100 or fewer patients per week and those treating more than 100 patients per week on the likelihood of treatment benefits existed. Orthodontists with a higher patient volume

(scaled mean=5.09) rated treatment benefits as more likely than orthodontists with a lower patient volume (scaled mean=4.87).

A single interaction effect was observed for orthodontists. For younger (48 years or less) orthodontists, high patient volume (100 patients or more per week) increased the expected benefits of orthodontic treatment (scaled mean=4.74 for low volume compared to scaled mean=5.13 for high volume). However, for older orthodontists (49 years or older), no significant increase in expected treatment benefits occurred.

Discussion

These data are useful from two perspectives. First, they help us begin to understand why parents spend large sums of money and time to provide their children with orthodontic treatment. The overall high value placed on treatment benefits suggests that parents greatly value the benefits they believe orthodontic treatment will provide. Furthermore, parents' overall low ratings of treatment risks suggest that parents seeking treatment overall believe the risks of orthodontic treatment are quite unlikely. Even modest "risks" of orthodontic treatment, such as changing foods and pain after appointments, were rated as only mildly undesirable or even desirable by most parents in our sample, suggesting that the inconveniences of treatment are perceived as small compared to the expected and valued benefits of treatment. These findings are consistent with the findings of Shaw et al. (10), where roughly 75 percent of parents in the United States and Wales expected career-related and social benefits from orthodontics. Furthermore, even though a direct comparison of parent and orthodontist expectations was not feasible in the present study (recall that orthodontists rated likelihoods for a typical child in their practice, while parents rated expectations for their specific child), parents and orthodontists appeared to have similar expectations with respect to treatment benefits and, to a smaller extent, treatment risks.

The present study also raises the question of whether parents' expectations of treatment are likely to be realized. Examination of five items concerning dental health and self-esteem suggests that parents and orthodontists expected that orthodontic treatment would enhance oral health and enhance self-esteem. While such expectations may be realized, existing studies have been unable to detect an effect of orthodontic treatment on either self-esteem or oral health (3-7,19,20). To be sure, there is no way to know if these research findings represent a flaw in our ability to detect an effect or whether orthodontic treatment simply does not provide these benefits. Nonetheless, the fact that neither parents nor orthodontists appeared to be aware of the uncertainty of gaining these benefits is important for both orthodontists and dental educators to note.

While the observed relationships between likelihood assessments or value assessments and sociodemographic variables must be considered tentative because of the preliminary nature of the instrument and the relatively crude sociodemographic measures, the relationships are nonetheless suggestive of larger issues. For value assessments, females placed a higher value on treatment benefits than males; however, the two groups actually expected comparable benefits from treatment. Women also expected greater short-term and long-term risks from treatment, but did not value those risks differently from males.

Women may have rated benefits as more valuable than men because the items in the "benefits" scale largely encompass social/personal and appearance items. Both social relationships (21) and appearance (22) have been noted as being central to female cultural values, while the same has not been noted for men. Likewise, women's expectancies of higher treatment risks may reflect mothers' role as primary caretakers of children in western culture (22). That is, as the parent who is more involved with children's medical care, mothers may be more familiar with children's health problems and thus come to expect them more readily.

Two income-based group differences emerged. The first suggested that higher income parents expected more treatment-related inconveniences. This finding may be an artifact of unemployment (i.e., appointments are less convenient for employed parents; employed parents report higher incomes). However, our cursory demographic measures did not allow us to test this hypothesis. The second income-based difference emerged as an interaction with education. For families with more educated fathers, higher income appeared to increase expectations of treatment benefits, while the reverse held true for families with less educated fathers. Why would families with higher incomes, but less educated fathers, expect less from orthodontic treatment? Perhaps well-paying jobs requiring little classroom-based education are less appearance-based or socially based. Future studies must carefully delineate the often overlapping issues of unemployment, income, education, and single parenthood; all social conditions could greatly affect the expectations and value assigned to orthodontic treatment.

Unlike parents, orthodontists' value of treatment benefits, risks, and inconveniences did not vary as a function of demographic or practice variables. However, orthodontists with relatively greater patient volumes rated treatment benefits as more likely. Furthermore, younger orthodontists with high patient volumes expected even more treatment benefits for their patients. This mean difference in expected benefits may represent greater exposure to treatment benefits, i.e., treating more patients provides greater opportunity to witness treatment benefits, or it may represent an effort to alleviate cognitive dissonance produced by long, busy work days. More in-depth research concerning orthodontists' work styles and treatment beliefs is necessary to explore this issue fully.

In addition to their ability to inform us about why parents seek orthodontic treatment for their children, these data also represent an important first step in the development of an instrument that practitioners could easily use to assess an individual parent's expectations and values regarding orthodontic process and outcome. Through factor analysis, the questionnaire was shortened from 88 to 52 items, making it amenable for in-office, preconsultation use. The completion of a standardized, self-administered questionnaire such as this prior to the patient/parent conference can aid the orthodontist in three distinct ways. First, a questionnaire such as this can identify unrealistic treatment expectations and thus assist the ortho-

dontist in tailoring his or her efforts at parent education. Second, it can aid the orthodontist in presenting how orthodontics will or will not address the patient's concerns. Third, it can assist the orthodontist in providing thorough informed consent. A self-administered questionnaire decreases the likelihood that questions will be phrased differently depending on the orthodontist's available time and diagnostic assessment of the patient's problems and decreases the likelihood of the parent responding to an open-ended question in a way that the parent believes the orthodontist expects or wants.

Despite the promising nature of the data presented here, several important limitations must be noted. First, generalizing beyond these data is ill-advised. The sample of parents is unlikely to be representative of all parents of orthodontic patients. Our sample was a clinic sample from a single university. Parents from private practices were not represented, nor were parents from other regions of the United States or abroad. Likewise, the sample of orthodontists was from a single state, and represented a response rate slightly greater than 50 percent. While such a response rate is within the typical range for a mail survey of professionals, it still begs the question of how nonrespondents might have responded to the questionnaire. These data are limited also because they are "self-report" data. Without appropriate follow-up studies, we cannot know what effects social desirability, or even doubts about anonymity, might have had on respondents' replies.

Finally, this questionnaire must be followed by comprehensive validity studies. While parents and orthodontists stated that the questionnaire "made sense" and was easy to follow, suggesting good face validity, and the observed relationships between certain subscales and demographic variables support the notion that the observed subscales measure distinct constructs, evidence for construct validity is lacking. Theories must be outlined that would predict relationships between important independent variables (i.e., malocclusion, treatment preferences, social variables, and economics) and the constructs we have identified through factor analysis (i.e., likelihood of social benefits, short-term risks, long-term risks, and inconvenience; value of social benefits, short-term risks, long-term risks, and inconvenience). Such validity data will enable researchers to be confident that they are indeed measuring meaningful entities through use of this questionnaire.

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