

Customer Satisfaction and Benefit With CIC Hearing Instruments

By Sergei Kochkin, PhD

Consumer satisfaction ratings of Completely-in-the-Canal (CIC) instruments are equal or favorable to the most current MarkeTrak profile. CICs received better scores in key areas such as visibility, directionality, feedback, and performance while on the phone and in outdoor situations. Statistics point to CICs attracting a more youthful, less hearing-impaired market. CICs provide benefit, as measured by the APHAB, equivalent to the typical new hearing instrument.



In previous publications on the CIC (Completely-In-the-Canal) hearing instrument market, it has been demonstrated that CIC hearing instruments represent a significant opportunity for the hearing instrument industry.¹⁻³ Knowles research reveals that there is a significantly higher purchase intent for CICs among new users and current users and that they also have a very positive image among the 20-million hearing-impaired nonowners in the United States. Compared to traditional hearing instruments, the nonowner with a hearing loss believes that CICs are superior with respect to cosmetics, comfort, performance, value and technology.

The potential advantages of CICs over conventional instruments are generally believed to be: increased gain and output, reduced distortion and feedback, improved localization, reduced wind noise, improved fit and comfort and reliability (due to wax), improved telephone and headset use and, of course, improved cosmetics.⁴⁻⁸ In addition, one study⁹ with 28 subjects demonstrated very high satisfaction ratings with CIC instruments and substantial bene-

fit as measured by the Abbreviated Profile of Hearing Aid Benefit (APHAB).

While the CIC may have an enhanced image among potential consumers (because of its small size), it has an image problem among some dispenser and manufacturer segments. Some industry leaders are concerned that CICs may actually lower customer satisfaction ratings and damage the overall market. There is also the belief that CICs can not possibly perform because they lack the advanced signal processing of larger hearing instruments and that the hearing-impaired person and the dispenser serving that person should choose the "performance solution" over cosmetics. Inherent in this argument is the belief that a cosmetic solution may not offer the consumer a performance solution at the same time, because of its size.

The objectives of this paper are to report consumer satisfaction and benefit with CIC hearing instruments compared to the typical user of hearing instruments, as measured in Knowles' national MarkeTrak research.¹⁰ Most manufacturers of CIC hearing instruments were approached by this author to participate in an omnibus survey of CIC instruments. Four manufacturers agreed to participate in this study. Close to 1200 consumers of CIC hearing instruments report on their experiences below.

Survey Method

With respect to satisfaction, 34 areas of satisfaction were measured using a 5-point Likert scale (very satisfied, satisfied, neutral, dissatisfied and very dissatisfied). The 34 items were broken down into the following categories: overall index



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(1), hearing instrument product features (8), performance and value (9), performance in specific listening situations (10) and dispenser service (6). In addition, five behavioral measures were captured (hours worn per day, impact on quality of life, likelihood of repurchasing hearing instrument brand, repurchasing from dispenser, and in recommending hearing instruments to friends).

The APHAB¹¹ consists of 24 items scored on four 6-item subscales: Ease of Communication (EC), Background Noise (BN), Reverberation (RV) and Aversiveness of Sounds (AV). The respondents completed the APHAB under both aided and unaided conditions in the same administration by indicating the percent of time they experienced problems hearing under the situations described in the inventory. A person's score on each subscale is the mean rating of the six items making up each of the subscales. In developing the APHAB norms, and by consultation with the author of the APHAB (Robyn Cox, PhD), a subscale was scored only if the respondent answered four (4) or more items within a specific subscale. Benefit is defined as the difference between unaided and aided conditions; benefit can thus be operationally defined as a change score indicative of hearing problem reduction or reduction in handicap.

In addition, total APHAB scores were computed (aided, unaided, benefit) by taking the mean subscales EC, BN and RV. The rationale for combining these subscales was based on the results of a factor analysis of the subscale total unaided scores.¹⁰

Each participating manufacturer sent a MarkeTrak customer satisfaction survey and the APHAB to subjects purchasing a CIC hearing instrument at least 90 days in the past. Some manufacturers had access to names and addresses based on warranty information while other manufacturers recruited dispensers to supply names and addresses of CIC purchasers. All surveys were confidential and were returned direct to the manufacturer. In turn, the surveys were returned to Knowles Electronics for keypunch and computer scoring. The reader should be aware that because of the sampling method employed, the potential for bias does exist. But, it is my experience after conducting close to a dozen customer satisfaction studies in this industry, that bias is at a minimum. Each participating manufac-

turer's CIC sample is reported separately: linear 1 (n=605), linear 2 (n=218), K-Amp (n=88), input compression (n=277), as are total CIC findings (n=1188). Total CIC results were derived by weighting the four samples by the manufacturers CIC market share.

Results

► Does the CIC attract a new type of customer?

It has been forecast in an earlier publication² that the CIC will attract a new type of customer, one that is younger with less hearing difficulty. Table 1 compares the demographics of CIC users with the typical user as measured in the MarkeTrak IV research (only subjects purchasing a hearing instrument in 1993-94). The CIC user is shown to be significantly different from the typical user on nearly all demographics measured. They have a less severe hearing disability as measured by the unaided total APHAB (Mean=58.5 versus 62.5), are less likely to view their hearing loss as "severe" or "profound," but

are equal in terms of number of ears impaired. They are significantly younger, more likely to purchase binaurally (78% versus 66%) and there is a tendency for CICs to appeal more to males.

For the years 1993-94, new users were only 29%, precipitously down from 41% in 1991 and 53% in 1989.¹² In contrast, CICs have attracted a significantly higher number of new users (40% than in the recent past. The CIC user, on average, has been a hearing aid owner for 8.5 years, two years less than the typical user. In addition, they wear their CICs significantly more than the typical user (11.7 hours per day versus 9.4 hours).

► CIC Customer Satisfaction

Table 2 documents detailed satisfaction/dissatisfaction ratings for the four CIC samples, total CIC sample, and the MarkeTrak IV sample; Table 3 portrays each sample's statistical relationship to the MarkeTrak IV norms, while Figures 1-3 graphically portray customer satisfaction comparisons

Table 1: Comparison of CIC and MarkeTrak IV user demographics

Factor	MarkeTrak Population	CIC Users	Difference	Significance Confidence Level
Hearing disability (Unaided APHAB)				
Lower Quartile	26%	30%	4%	99.9%
Second Quartile	26%	33%	7%	
Third Quartile	24%	23%	-1%	
Fourth Quartile	24%	14%	-10%	
Perceived hearing loss				
Mild	5%	8%	3%	99.9%
Moderate	47%	59%	12%	
Severe	40%	32%	-8%	
Profound	8%	1%	-7%	
Bilateral loss	82%	84%	2%	n.s.
Binaural purchase	66%	78%	12%	99.9%
Age category (yrs.)				
<17	2%	0%	-2%	99.9%
18-34	2%	2%	0%	
35-44	4%	4%	0%	
45-54	7%	13%	6%	
55-64	14%	20%	6%	
65-74	39%	34%	-5%	
75-84	27%	24%	-3%	
85+	6%	3%	-3%	
Gender				
Male	59%	66%	7%	99%
Female	41%	34%	-7%	
New User	29%	40%	11%	99.9%

Note: MarkeTrak IV hearing instrument owners includes only purchases for the years 1993-94.

on select factors for CICs and the typical user. The range of overall customer satisfaction ratings achieved between the four samples was 63-72% for an overall average of 69%, which is statistically equivalent to the typical user satisfaction rating for new hearing instruments (71%). Two of the samples (linear 2 and input compression) had statistically lower overall satisfaction ratings.

With respect to consumer behavior factors, quality of life ratings (72%), likelihood of positive word-of-mouth advertising (87%) and likelihood of repurchasing the same brand (62%) were statistically equal to MarkeTrak. The CIC group was more inclined to refer to

the dispenser who fit their CIC (91% versus 82%) and more likely to wear their instruments at least four hours per day (94% versus 87%). The higher likelihood of recommending the dispenser is also reflected in dispenser satisfaction ratings ranging from 90-96% (see Table 2, bottom section).

Referring to product, performance and value factors, the CIC is shown to be equal to the typical instrument on fit/comfort, frequency of cleaning, ease of battery change, battery life, perception that the product "improves hearing," reliability, and clearness of tone. The CIC receives statistically higher ratings on visibility (92% versus 62%), packaging, warranty,

on-going expense, "natural" sounding (64% versus 58%), ability to tell direction of sound (64% versus 49%), whistling/feedback and buzzing (60% versus 42%), and use in noisy situations (43% versus 37%). However, it should be noted that only the K-Amp sample achieved statistically higher ratings on clearness of sound and use in noisy situations.

The CIC instrument receives significantly lower ratings on ease of volume adjustment (41% versus 77%) and value (55% versus 61%). The survey specifically defined value as "performance versus money spent."

The MarkeTrak survey asks the consumer to rate satisfaction in

Table 2: Percent satisfaction/dissatisfaction for four CIC user samples compared to MarkeTrak IV users

	PERCENT DISSATISFIED						PERCENT SATISFIED					
	Linear 1	Linear 2	K-Amp	Input Compress.	Total CIC	MarkeTrak IV	Linear 1	Linear 2	K-Amp	Input Compress.	Total CIC	MarkeTrak IV
Overall satisfaction	11	16	6	18	12	7	71	64	72	63	69	71
Consumer Behavior												
Quality of life (Note 1)	2	3	1	6	2	1	73	66	79	62	72	73
Recommend hearing aids to friend (Note 2)	3	5	0	5	3	3	87	82	92	80	87	89
Recommend person who fit hearing aid (Note 2)	1	3	1	3	2	6	93	87	93	84	91	82
Repurchase current brand of hearing aid (Note 2)	8	7	3	8	7	6	62	63	68	54	62	57
Wearing hearing instruments (Note 3)	1	0	0	0	0	4	94	98	95	95	94	87
Product Features												
Fit/comfort	6	5	8	11	6	4	82	80	69	74	81	83
Ease/volume adjustment	27	16	11	27	25	7	39	55	40	40	41	77
Visibility	1	2	0	4	1	4	94	87	94	85	92	62
Packaging	3	2	0	1	3	2	78	79	80	80	78	72
Frequency of cleaning	7	5	9	4	7	4	69	69	63	72	69	67
Warranty	4	8	5	5	5	8	79	74	71	71	78	65
Ease/battery change	5	2	1	2	4	3	84	85	95	93	85	87
On-going expense	11	13	15	19	12	13	60	49	49	40	57	47
Performance/Value Factors												
Battery life	14	17	20	28	16	14	59	55	47	38	56	61
Improves my hearing	6	4	0	8	6	5	82	79	86	73	81	82
Reliability	9	9	4	11	9	4	70	73	73	65	70	75
Clearness tone/sound	8	11	4	19	8	7	68	62	77	58	65	65
Natural sounding	9	12	9	17	10	12	64	60	70	56	64	58
Value (Price vs. Performance)	18	21	17	23	18	11	57	47	50	42	55	61
Directionality	9	11	2	13	9	14	64	59	78	61	64	49
Whistling/feedback/buzzing	16	19	14	20	17	22	61	53	68	51	60	42
Use in noisy situations	31	30	14	33	30	35	41	44	63	51	43	37
Listening Environments												
One-on-One	2	4	0	5	3	2	91	88	95	85	90	93
T.V.	9	8	1	11	8	9	73	74	89	75	74	73
Small Groups	9	11	3	12	9	8	71	62	84	66	70	67
Place of worship	13	18	4	12	13	12	63	59	82	60	63	58
Outdoors	7	7	5	11	7	12	71	64	77	69	70	58
Car	12	12	9	15	12	14	62	62	71	63	62	59
Restaurant	22	18	10	19	21	20	50	52	66	52	52	52
Concert/Movie	19	19	5	15	15	19	51	45	72	51	51	49
Telephone	16	20	6	12	16	31	60	55	78	63	60	31
Large Group	32	33	15	31	31	32	36	31	54	37	36	28
Dispenser Service												
Professionalism/Dispenser	0	0	1	2	1	2	96	95	95	93	96	92
Knowledge/Dispenser	0	0	1	1	0	1	96	95	98	92	96	92
Quality of Service (during fitting)	1	0	1	4	1	2	96	94	97	89	95	92
Explained how to care for hearing instrument	1	0	2	1	1	1	96	99	95	92	96	91
Explained what to expect from hearing instrument	2	2	2	3	2	3	90	89	91	86	90	83
Post-purchase service	1	4	1	4	2	3	94	91	93	85	93	80

Note 1: Dissatisfied=Never, Satisfied=Most of the time or always

Note 2: Dissatisfied=No, Satisfied=Yes

Note 3: Dissatisfied=hearing instrument in drawer, Satisfied: use hearing instrument at least 4 hours per day.

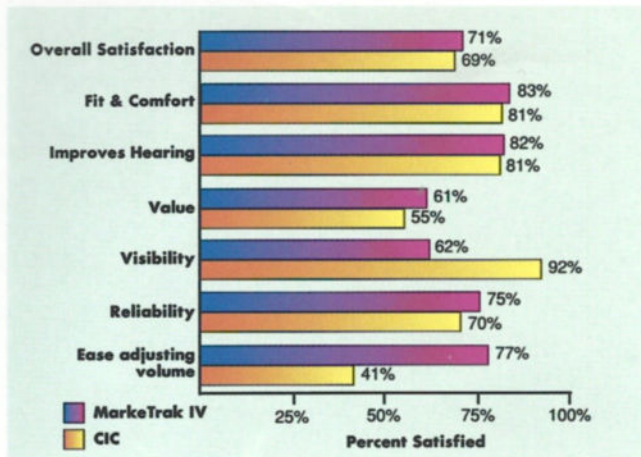


Fig. 1: Customer satisfaction with CIC hearing instruments on select factors.

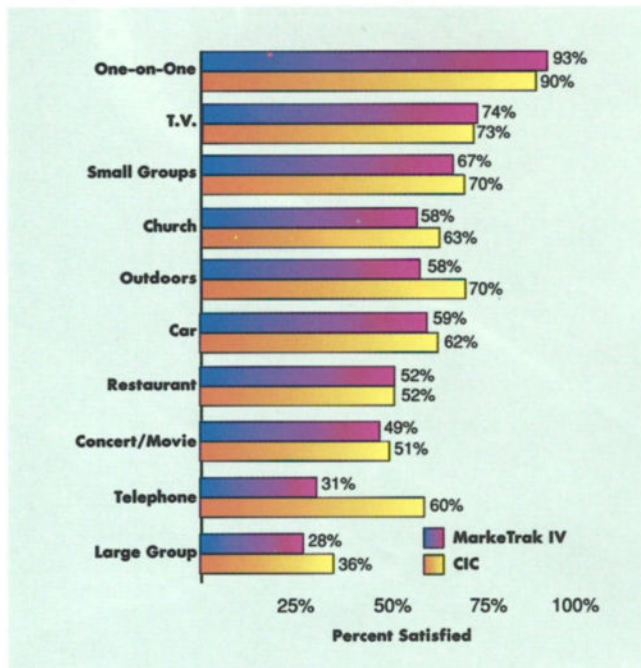


Fig. 3: Customer satisfaction with CIC hearing instruments in various listening situations.

ten listening situations. Previous research¹³ has shown that overall consumer satisfaction is highly dependent on the instruments' ability to improve hearing in multiple listening environments. The CIC was statistically equal to MarkeTrak in eight-of-ten listening situations and statistically higher in outdoor situations (70% versus 58%) and on the telephone (60% versus 31%). The K-Amp users reported statistically higher ratings in eight out of the ten listening situations, including situations historically low in customer satisfaction: large groups (54% versus 28%); restaurants (66% versus 52%), small groups (84% versus 67%), places of worship (82% versus 58%) and concerts/movie (72% versus 49%).

► CIC Benefit

Mean APHAB scores for each CIC sample, total CICs and MarkeTrak IV are shown in Table 4 and Fig. 4. The total CIC is statistically equivalent on benefit for each of the APHAB subscales, but is significantly lower (3.4% points) on overall benefit. Of note among the four samples is that two of the samples (linear 2 and input compression) provide significantly lower benefit on most of the scales while the K-Amp sample achieved significantly higher ratings on "aversiveness of sounds." However, it should be noted that all CIC samples are statistically lower on their unaided APHAB scores with the exception of aversiveness of sounds.

There is an inherent problem in

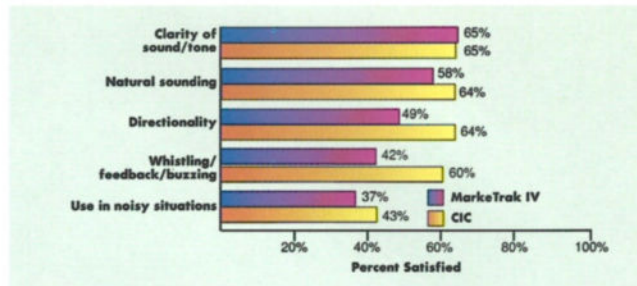


Fig. 2: Customer satisfaction with CIC hearing instruments on select performance characteristics.

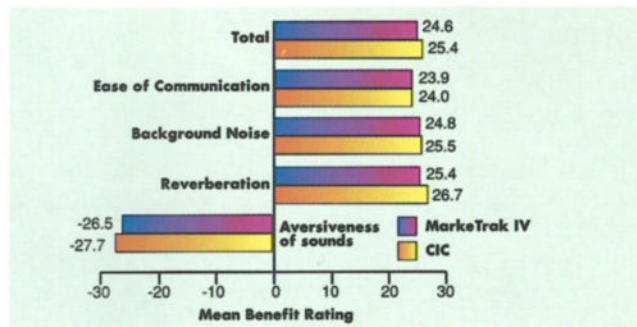


Fig. 4: Mean benefit ratings (APHAB) for CIC hearing instruments adjusted for differences in unaided scores.

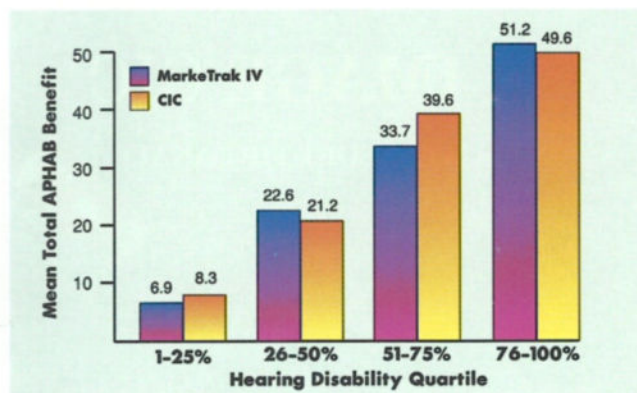


Fig. 5: Mean total benefit ratings (APHAB) for CIC hearing instruments by disability quartile adjusted for differences in unaided scores.

comparing hearing instrument populations when they have significantly different disabilities. In a previous publication,¹⁰ it has been shown that APHAB benefit scores are highly sensitive to the disability of the individual as measured by the Hearing Handicap Inventory for the Elderly (short form), perception of loss, and unaided APHAB scores. Subjects with higher unaided scores are able to achieve higher benefit scores while less disabled subjects are expected to have lower benefit scores. Thus, it would be inappropriate to make inferences about the efficacy of one technology over another unless the consumer populations using the respective technology are statistically equivalent on hearing disability. An alternative to statistically

Table 3: Satisfaction for four CIC user samples compared to MarkeTrak IV users.

	Linear 1 n=605	Linear 2 n=218	K-Amp n=88	Input Compression n=277	Total CIC n=1188
Overall satisfaction	=	L	=	L	=
Consumer Behavior					
Quality of life (Note 1)	=	=	H	=	=
Recommend hearing aids to friend	=	L	=	LL	=
Recommend person who fit H.I.	HHH	=	H	-	HHH
Repurchase current brand of H.I.	=	=	=	=	=
Wearing hearing instruments	HHH	H	=	=	HHH
Product Features					
Fit/comfort	=	=	=	L	=
Ease/volume adjustment	LLL	LLL	LLL	LLL	LLL
Visibility	HHH	HHH	HHH	HHH	HHH
Packaging	HHH	HH	H	H	HHH
Frequency of cleaning	=	=	=	=	=
Warranty	HHH	H	=	H	HHH
Ease/battery change	=	=	=	=	=
On-going expense	HH	=	=	L	HH
Performance/Value Factors					
Battery life	=	=	=	LLL	=
Improves my hearing	=	=	=	LL	=
Reliability	=	=	=	LL	=
Clearness tone/sound	=	=	HH	L	=
Natural sounding	H	=	H	=	H
Value (Price vs. Performance)	=	LL	=	LLL	LL
Directionality	HHH	H	HHH	H	HHH
Whistling/feedback/buzzing	HHH	H	HHH	HH	HHH
Use in noisy situations	=	=	HHH	=	H
Listening Environments					
One-on-One	=	=	=	LL	=
T.V.	=	=	HHH	=	=
Small Groups	=	=	HHH	=	=
Place of worship	=	=	HHH	=	=
Outdoors	HHH	H	HHH	H	HHH
Car	=	=	=	=	=
Restaurant	=	=	HHH	=	=
Concert/Movie	=	=	HHH	=	=
Telephone	HHH	HHH	HHH	HHH	HHH
Large Group	=	=	HHH	=	=
Dispenser Service					
Professionalism/Dispenser	HHH	HHH	HHH	HH	HHH
Knowledge/Dispenser	HHH	HHH	HHH	HH	HHH
Quality of Service (during fitting)	HHH	HHH	HH	=	HHH
Explained how to care for H.I.	HHH	HHH	HH	H	HHH
Explained what to expect from H.I.	HHH	HHH	HH	H	HHH
Post-purchase service	HHH	HHH	HHH	H	HHH

NOTE: Equal sign (=) means statistically equivalent to MarkeTrak IV user population; L=statistically lower; H=statistically higher. 1 letter =95% confidence level; 2 letters=99% confidence level; 3 letters=99.9% confidence level.

equivalent populations is to: 1) segment the population into hearing loss disability groups (cohort analysis), or 2) statistically calculate benefit scores adjusting for differences in unaided scores (analysis of covariance).

In Table 4, the benefit means (least squares) were statistically adjusted using analysis of covariance techniques. When adjusting for differences in disability, now the linear 2 and input compression samples are shown to be statistically equivalent to the typical hearing instrument with respect to benefit achieved. The K-Amp CIC was statistically superior on all scales but background noise. The K-Amp CIC would appear to be associated with

a significant reduction in the aver-siveness of sounds.

In Fig. 5, mean benefit scores by hearing disability group for total CICs and MarkeTrak are graphically portrayed. The disability groups are based on the unaided total APHAB score of the hearing instrument users. For instance, the 1-25% quartile represents users whose professed hearing disability is in the lower 25% of the United States. CIC hearing instruments are shown to provide statistically equivalent benefit for subjects in the first, second and fourth quartiles of disability and statistically higher benefit for subjects in the third quartile. While the aided APHAB is not an audiological mea-

sure of hearing loss, one can infer that CIC hearing instruments provide equivalent or better benefit at all hearing loss disability levels.

Conclusions

1 CIC instruments attract younger, less hearing disabled consumers and are attracting new users to the hearing instrument industry; but the CIC user is still quite similar to the typical user in their demographic profile.

2 Overall customer satisfaction is equal to the typical hearing instrument in the U.S. market (heavily weighted ITE/ITC). CICs are statistically superior on such key factors as visibility, directionality, whistling/ feedback/buzzing,

Table 4: Mean benefit as measured by the APHAB for CIC hearing instruments compared to MarkeTrak IV.

— Means —

Benefit scale	MarkeTrak				Input Compression	Total CIC
	IV	Linear 1	Linear 2	K-Amp		
Total						
Unaided	63.6	58.8***	58.1**	58.4*	55.9***	58.5***
Aided	34.8	33.0	35.8	28.8	31.9	33.0
Benefit	29.0	26.0	22.2**	29.4	23.0**	25.6*
Benefit (adjusted)	24.6	25.6	22.4	29.4*	25.9	25.4
Ease of Communication (EC)						
Unaided	57.0	52.9*	57.0	53.9	48.3***	52.8*
Aided	29.4	28.9	31.0	25.2	27.9	28.9
Benefit	27.8	24.1	22.4	28.7	20.5**	24.0
Benefit (adjusted)	23.9	24.0	21.6	28.3*	24.8	24.0
Background Noise (BN)						
Unaided	64.1	61.0*	59.2**	59.0*	56.4***	60.4**
Aided	36.9	35.1	38.0	30.7**	33.7*	35.2
Benefit	27.3	26.0	21.2**	28.1	22.8*	25.3
Benefit (adjusted)	24.8	25.8	21.8	28.9	26.2	25.5
Reverberation (RV)						
Unaided	69.0	62.7***	60.8***	62.7*	59.4***	62.2***
Aided	38.9	35.8*	38.7	31.5***	35.6*	35.9*
Benefit	30.3	27.0	22.0***	30.9	23.8**	26.4*
Benefit (adjusted)	25.4	26.9	23.7	30.7*	26.5	26.7
Aversiveness of Sounds (AV)						
Unaided	23.1	21.9	24.7	19.7	22.5	22.1
Aided	49.0	50.9	49.3	36.9***	46.7	49.6
Benefit	-25.9	-29.0	-24.8	-17.4**	-24.2	-27.6
Benefit (adjusted)	-26.5	-28.9	-26.3	-15.9***	-24.5	-27.7

NOTE: The MarkeTrak IV population includes only subjects with hearing aids less than or equal to one year of age. * = 95% confidence level; ** = 99% confidence level; *** = 99.9% confidence level.

and performance on the telephone and in outdoor environments. The CIC instrument receives statistically lower ratings, however, on value and ease of adjusting volume. (Note: a number of methods of addressing consumer access to a volume control are currently being addressed by manufacturers.)

3 CICs provide benefit equivalent to the typical new hearing instrument sold. In the absence of audiological data, we can infer that the CIC provides benefit to a wide variety of hearing disabilities. The more disabled the individual, the greater the expected benefit reported by users.

4 It is unfortunate that the K-Amp sample was so small (n=88). The preliminary results indicate that it may be superior in improving satisfaction in noisy and more difficult listening situations. This finding is substantiated by the significantly higher satisfaction ratings in eight out of the ten listening situations and the results on the APHAB. Notably, there would appear to be a substantial reduction in reported aversiveness of sounds. Given the positive K-Amp findings, it would be desirable to replicate this study across multiple K-Amp samples and multiple brands.

5 In evaluating the value of

input compression circuitry in CICs, it should be understood that the sample obtained was from one manufacturer and that all input compression CICs cannot be judged on this one finding. Thus, we would hope to replicate the input compression study across multiple samples and multiple brands. Similarly, other high-tech signal processing circuits have not yet been tested using the methodology in this paper.

We hope this paper contributes to the ongoing industry dialogue concerning the impact of hearing instruments on the quality of life of the consumers we serve. ♦

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