Adult and Peer Perceptions of Children with Visible Hearing Aids

Perception d'adultes et d'enfants concernant les enfants portant des appareils auditifs visibles

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KEYWORDS

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Abstract

Hearing aids may be critical in assisting children with hearing loss to develop to their optimal potential. However, stigma reduces patient adherence, possibly leading to negative psychosocial consequences in children. As wearable technology becomes increasingly ubiquitous, we hypothesize that there will be reduced stigma associated with children seen wearing hearing aids. The purpose of this study was to investigate the perceptions of individuals with normal hearing towards children wearing visible hearing aids in a hospital setting. We recruited parents and children attending the British Columbia Children's Hospital in Vancouver, British Columbia, Canada to assess the photographs of children with and without behind-the-ear hearing aids by completing a survey. They were randomly shown three photos of different children, with one or two wearing a hearing aid, and rated the pictures across healthiness, friendliness, intelligence, happiness, and physical fitness on a visual analog scale. Participants (n = 219) included 116 parents and 103 children. Adults rated children wearing hearing aids more positively in friendliness (p = .04) and happiness (p = .007). In all other attributes, rated by adults or children, there were no statistically significant differences. Our study did not show negative bias against children wearing visible hearing aids compared to their normal hearing peers. Potential response bias may have influenced adult ratings and the hospital setting may have biased the responses of children and adults. This study suggests the potential for reduced societal stigma associated with wearing visible hearing aids in children by adults and children in the general population.

Abrégé

Les appareils auditifs peuvent jouer un rôle important chez les enfants ayant une perte auditive en les aidant à se développer à leur plein potentiel. Cependant, la stigmatisation entourant ces appareils peut diminuer l'adhésion des patients, ce qui peut engendrer des conséquences psychosociales négatives chez les enfants. Puisque les objets personnels connectés deviennent de plus en plus courants dans la société, nous émettons l'hypothèse que les enfants portant des appareils auditifs visibles seront moins stigmatisés. L'objectif de cette étude était donc d'investiguer la perception d'individus ayant une audition normale concernant les enfants portant des appareils auditifs visibles dans un milieu hospitalier. Nous avons recruté des parents et des enfants fréquentant le British Columbia Children's Hospital localisé à Vancouver, Colombie-Britannique, Canada, afin qu'ils répondent à un questionnaire leur demandant d'évaluer des photographies d'enfants avec et sans appareil auditif de type contour d'oreille. Trois photos d'enfants différents choisies au hasard leur étaient montrées, dont une ou deux d'un enfant portant un appareil auditif. Les participants devaient juger de la santé, de l'amabilité, de l'intelligence, du bonheur et de la condition physique des enfants apparaissant sur chacune des photos à l'aide d'une échelle visuelle analogique. L'échantillon (n = 219) était composé de 116 parents et de 103 enfants. Les adultes ont jugé l'amabilité (p = 0,04) et le bonheur (p = 0,007) des enfants portant des appareils auditifs plus positivement. Aucune différence statistiquement significative n'a été observée pour les autres attributs, et ce, tant chez les adultes que les enfants. Notre étude n'a pas montré l'existence d'un biais négatif envers les enfants portant des appareils auditifs visibles, lorsque comparés à leurs pairs ayant une audition normale. Il est possible qu'un biais dans les réponses ait influencé le jugement des adultes et que l'environnement hospitalier ait biaisé les réponses données par les enfants et les adultes. Les résultats de la présente étude suggèrent une possible réduction de la stigmatisation sociale associée au port d'appareils auditifs visibles chez les enfants auprès des adultes et des enfants de la population générale.

Hearing loss is one of the most common congenital conditions in Canada. Four percent of children aged 3–5 have conductive hearing loss and 8% of children aged 6–19 suffer from some form of hearing loss in Canada (Statistics Canada, 2012); 32 million children worldwide have disabling hearing loss (World Health Organization, 2018). It is estimated that up to 6 in 1000 babies are born with some degree of permanent hearing loss or will develop permanent, progressive childhood hearing loss—a number that surpasses other routinely screened for congenital conditions such as phenylketonuria and hypothyroidism (Alberta College of Speech-Language Pathologists and Audiologists, 2010; Mehl & Thomson, 1998; Patel & Feldman, 2011). Furthermore, hearing is critical in the development of language, literacy, and psychosocial skills. Children who have impaired hearing have demonstrated detrimental impacts on their socioemotional, communicative, and cognitive development as evidenced through lower academic achievement and increased psychological distress (Lieu et al., 2020; Mason & Mason, 2007; Tomblin et al., 2020; Walker et al., 2020).

Wearable hearing devices, such as behind-the-ear digital hearing aids, semi-implantable bone conduction hearing aids, and cochlear implants, have been shown to enable children with impaired hearing to improve their hearing, language, and cortical development (Alberta College of Speech-Language Pathologists and Audiologists, 2010; Patel & Feldman, 2011). However, despite these benefits, previous research has suggested that stigma has played a major role in why people who have hearing loss may reject the use of a hearing aid when medically indicated (Bartkiw, 1988; Ryan et al., 2006; Strange et al., 2008). Previous studies conducted in the 1970s and 1980s have reported overall negative impressions of adults and children towards photographs of children wearing visible hearing aids. Children wearing a hearing aid were rated significantly lower in terms of their perceived intelligence, personality, appearance, attractiveness, and achievement (G. W. Blood et al., 1978; I. M. Blood, 1997; Dengerink & Porter, 1984; Silverman & Klees, 1989). This stigma has consequently been characterized as the "hearing aid effect" and may affect adherence in children who require wearable hearing devices (G. W. Blood et al., 1978; I. M. Blood, 1997; Ryan et al., 2006; Strange et al., 2008). Wearing visible hearing devices may also have negative psychosocial consequences for children themselves. In particular, interview data and quality of life measures have demonstrated that these children experienced bullying, lower levels of self-esteem, and decreased participation in school in comparison to their peers (Meyer et al., 2013; Sweeting & West, 2001).

Over the past decade, wearable technology in society has become commonplace, especially with the advent of devices such as smart watches, smart glasses, and Bluetooth earpieces (Kosir, 2015; Rauterkus & Palmer, 2014). Children and adolescents frequently wear headphones in public to enjoy music, and they are unlikely to draw significant attention. As wearable technology becomes increasingly ubiquitous, we hypothesized that there may be a similar trend towards greater acceptance of visible hearing devices by the general public. Although there has been evidence in the literature on the existence of a hearing aid effect in the past, there is little recent work investigating this stigma in the pediatric population. Our study objective was to gain a better understanding of current attitudes towards the use of visible hearing devices among children and parents in a hospital setting. By assessing the perception of typical hearing adults and their children towards images of children who do or do not wear visible hearing devices, we aimed to discover if attitudes towards these children have changed from the historically poor perceptions in previous research studies.

Method

This cross-sectional study was conducted at British Columbia Children's Hospital from August 2016 to September 2016. Ethical approval for this study was obtained from the University of British Columbia Children's and Women's Research Ethics Board (H16-01537).

Participant Selection

Participants for Photographs

We obtained informed consent from six children to participate in the study—one boy and one girl, between 8 and 10 years of age, from three different ethnic groups (Caucasian, East Asian, and South Asian). These participants were recruited from the Pediatric Otolaryngology Clinic at British Columbia Children's Hospital to act as models for the photographs that were used in the study. As per Canadian Census data, these are the three predominant ethnicities in this geographical location (Statistics Canada, 2011). These children did not use hearing aids and were considered otherwise healthy children. Exclusion criteria for participants to be photographed were having any other visible impairments or medical conditions that may introduce study bias. All the children were outfitted with the external portion of a conventional behind-the-ear hearing aid for the photographs. Two photographs of each child were taken, one with a hearing device on and one without, for a total of 12 photographs. All children were photographed facing towards the camera at the same distance and angle with the same background, and each

child had the same facial expression (neutral expression). The only three variables differing between pictures were the presence of a hearing aid, ethnicity, and gender. All other variables were controlled for to mitigate any possible bias that could influence a participant's impression of the photographs.

Participants for Main Study

A convenience sample of 116 parents/legal guardians and 103 children were approached and recruited from the main hospital entranceway, the Pediatrics Clinic, the Orthopedics Clinic, and general waiting areas at the British Columbia Children's Hospital. Written informed consent was not required for these participants as per the local Research Ethics Board because no personally identifiable information was collected linking these participants to their responses. However, all participants were verbally informed about the study prior to participation. Parents/legal guardians and children were recruited as dyads (pairs from the same family) and only one parent/legal guardian and one child from each household were invited to participate. Parents/legal guardians unaccompanied by their children or with young children/babies unable to participate were also recruited, but not as dyads. Participants were asked to provide verbal consent/assent and no children were approached or recruited without a parent/legal guardian present.

Children eligible for this study were between the ages of 5 and 17 (inclusive) at the time of recruitment. Children were excluded from the study if they already had a sibling who had participated in the study, were being treated for hearing impairment themselves, and/or had a neurodevelopmental disorder. Similarly, for parents/legal guardians to participate they must have been the primary caregiver for at least one child at the time of recruitment. Additionally, if the parent/legal guardian was being treated for hearing impairment or had a child who was being treated for hearing impairment or if they had neurodevelopmental disorder, they were excluded from the study. Parents and children self-reported their medical information.

Data Collection, Storage, and Handling

Participants were recruited at the first point of contact and were randomly shown three images—with at least one child from each gender, one child from each ethnicity, and at least one child wearing a visible hearing aid—using a bank of 12 photographs in total (six images of a child with a hearing aid and six without). The same image of a particular child, with and without a hearing aid, was not shown to a single participant. Participants then answered five questions about their perspectives on the images using a sliding visual analogue scale from 0–100 (continuous variable). They rated the images of these children on the five attributes of healthiness, friendliness, intelligence, happiness, and physical fitness, which is a modified version of Silverman and Largin's (1993) original adjective scale. This scale was validated for use in examining the hearing aid effect, especially in the context of children, as it has good internal consistency (Cronbach's $\alpha = .87$; Silverman & Klees, 1989; Strange et al., 2008). The order in which the questions were presented in the questionnaire was also randomized. In addition, the participants' age and gender were recorded.

Parents/legal guardians and their children responded to the questions privately and did not share responses with each other, inputting their responses themselves. Fluidsurveys, a Canadian-based secure online survey tool, was used to collect and store the data, and participants entered their responses on an Apple iPad. Participants were not made aware of the study's true objectives—to assess perceptions towards children wearing visible hearing aids—until after the data was collected. Afterwards, the participant was debriefed with the study's true objectives.

Primary and Secondary Outcomes

The primary outcome measures were the total average score (from 0—100) across the five attributes of (a) parents/legal guardians and (b) children for children wearing visible hearing aids compared to those without. A comparison was then made for both adult and child participants between the total ratings towards children wearing hearing aids and those without.

The secondary outcome measures included subanalysis comparisons between the separate scores toward images of children wearing a hearing aid and those without for each of the five different attributes assessed (i.e., healthiness, friendliness, intelligence, happiness, physical fitness). This was completed for both children and parents/legal guardians. Additionally, comparisons between the total scores for responses from children and the responses from their respective parents/legal guardians (parent–child dyads) were performed, as well as a comparison between age-stratified groups of child participants. Differences between genders and ethnicities were also examined.

Data Analysis

Basic descriptive statistics were reported, including average age and gender. The main outcome was reported as a continuous variable from 0 to 100. The primary analysis was a comparison of the total scores using a paired, one-tailed *t*-test to determine if there were statistical differences between the scores towards the pictures of children wearing

hearing aids compared to the pictures of children without. Assumptions of using the paired *t*-test for our data analysis included that the data itself were continuous, followed a normal distribution, and were independent of each other. Subanalyses comparing each of the five attributes separately were also evaluated using the paired, one-tailed *t*-test. The other secondary outcome was assessed using the same *t*-test to determine if there were statistical differences between the scores within parent–child dyads, and between the scores for child participants stratified by age. Additional subanalyses were conducted to find differences attributable to ethnicity and gender, which were analysed using the unpaired, one-tailed *t*-test and analysis of variance test, respectively. Statistical significance was set at $p < .05$.

Results

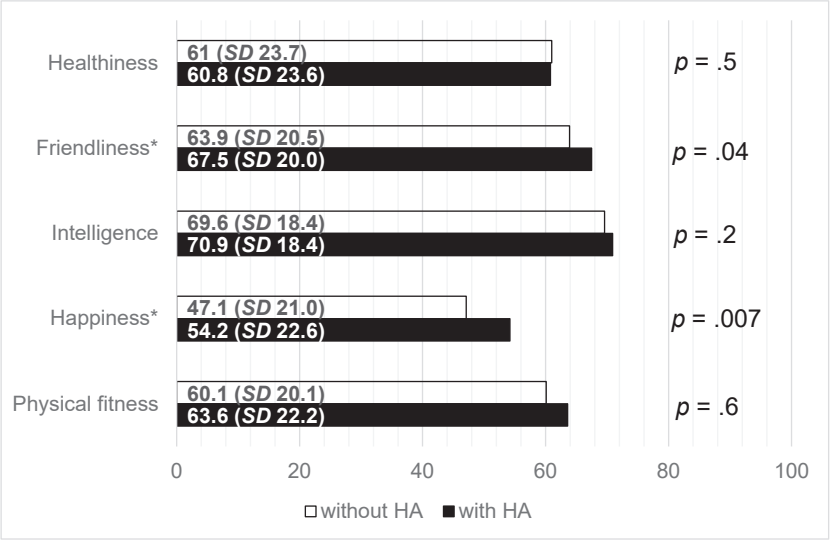
A total of 219 participants, 116 parents/legal guardians (M_{age} = 44.1 years, $range_{age}$ 22–75) and 103 children (M_{age} = 12.3 years, $range_{age}$ 5–17), were enrolled. Participants were primarily recruited from the Orthopedics Clinic at the British Columbia Children's Hospital, in addition to the General Pediatrics Clinic, and in the hospital entranceways. There was an even distribution of boys to girls among surveyed children (boy:girl ratio = 1.1:1), and for the adult population, predominantly women were surveyed (men:women = 0.3:1).

In adults, the total average score (combining all attributes) of the ratings of the images of children wearing hearing aids (M = 63.4, SD = 22.1) was higher than to those without hearing aids (M = 60.3, SD = 22.0), with a statistically significant difference in favour of the images of children wearing hearing aids, $t(460) = 1.65$, $p = .001$. No significant difference was found between the total ratings from child participants of the images of children wearing hearings aids (M = 55.2, SD = 21.9) and those without (M = 56.6, SD = 22.6), $t(408) = 1.65$, $p = .1$.

Among surveyed adults the images of children wearing hearing aids were rated more positively compared to the images of children not wearing them across all five attributes; however differences for only two of the five attributes—friendliness and happiness—were statistically significant (see **Figure 1**). For the children surveyed in this study, no statistically significant differences were found between the ratings of images of children with and without hearing aids on any of the attributes (see **Figure 2**).

We compared the responses between the 78 complete dyads of children and their parents (involving 156 participants). When comparing the dyads on ratings for images of children without hearing aids, there were no differences found between the total mean scores of parents (M = 60.6, SD = 22.3) to children (M = 58.5, SD = 21.9), $t(308) = 1.65$, $p = .07$. Further subanalysis demonstrated the only attribute with a statistically significant difference was intelligence, which adults rated higher than their children ($p = .01$; see **Table 1**).

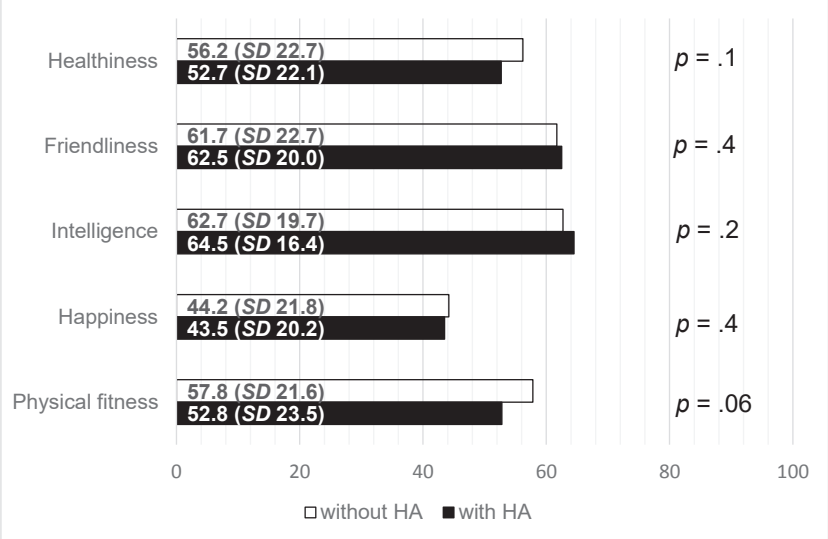
Figure 1



Adults' (n = 116) average ratings towards children with hearing aids (HA) or without

Note. *significant differences at $p \leq .05$.

Figure 2



Children's (n = 103) average ratings towards children with hearing aids (HA) or without

Table 1

Comparison of Ratings Between Adults and Children Towards the Without Hearing Aids Group (n = 78)

Attribute	Adults' score		Children's score		p
	M	*SD*	*M*	*SD*	
Healthiness	61.3	24.0	59.1	21.8	.3
Friendliness	64.6	20.6	63.4	21.4	.3
Intelligence*	70.6	17.6	64.5	19.3	.01
Happiness	47.7	21.9	45.6	21.9	.3
Physical Fitness	59.0	20.7	59.9	20.2	.4

Note. *significant differences at $p \leq .05$.

For comparison between the parent–child dyads towards children wearing hearing aids, there was a significant difference found between the total mean scores by parents (M = 65.0, SD = 21.9) compared to by children (M = 55.8, SD = 22.2), $t(308) = 1.65$, $p < .001$. The subanalysis revealed that adults had a statistically significant higher average rating compared to their children on all of the attributes (see **Table 2**).

Children's responses were divided into two groups, ages 5 to 11 years and 12 to 17 years, to uncover potential differences in perception based on age. There were 41 participants in the 5 to 11 childhood age range and 62 in the 12 to 17 adolescent range. When stratifying by age for child participants, there were still no significant differences found between the overall scores towards the images of children with hearing aids and without in either the childhood (p = .06) or the adolescence groups (p = .5). However, there was a difference (p = .03) found among children aged 12 to 17 on the healthiness attribute between images of children without hearing aids (M = 57.7, SD = 20.0) and with hearing aids (M = 51.2, SD = 20.8).

Table 2

Comparison of Ratings Between Adults and Children Towards the With Hearing Aids Group (n = 78)

Attribute	Adults' score		Children's score		p
	M	*SD*	*M*	*SD*	
Healthiness*	62.2	21.9	54.3	22.4	.01
Friendliness*	69.5	19.5	61.9	21.1	.01
Intelligence*	73.0	17.2	64.6	16.5	< .001
Happiness*	55.4	23.5	44.2	21.8	< .001
Physical Fitness*	64.9	21.4	54.3	23.3	.001

Note. *significant differences at $p \leq .05$.

An unpaired one-tailed *t* test was used to explore any differences in ratings for the test participants attributable to gender or ethnicity. There were no consistent differences attributable to test participants' genders with relation to hearing aid usage, but overall more positive scores were given to the images of female children than male children by both adult raters (M = 65.9, SD = 21.9 vs. M = 58.3, SD = 24.3, $p < .001$, respectively) and child raters (M = 59.9, SD = 24.9 vs. M = 51.5, SD = 24.4, $p < .001$, respectively). There were no statistically significant findings related to the ratings by test participant ethnicity.

Discussion

This study aimed to assess the perceptions of children and parents with normal hearing in a hospital setting towards children wearing visible hearing aids and those without. Research since the 1970s has reported stigma against children wearing hearing aids in the general population, but the increasingly widespread use of wearable technology in popular culture, coupled with the development in the form factor and discreetness of hearing devices, may have led to changes in opinion towards such children (G. W. Blood et al., 1978; Dengerink & Porter, 1984; Silverman & Klees, 1989). Our findings show that there does appear to be a lack of negative bias towards children wearing visible hearing aids compared to their normal hearing peers among children and their parent/legal guardian at our pediatric tertiary care centre. Interestingly, the adult participants in fact showed a slight positive bias towards children wearing visible hearing aids. Ratings by children appeared to have no bias towards children who wear hearing aids and those who do not, scoring images similarly across all five attributes. This lack of bias in the child cohort implies that whether or not another child wears a hearing aid had minimal influence on how the children perceive one another. Therefore, these findings suggest reduced stigmatization of children who wear visible hearing aids in a hospital setting and perhaps in the general population as well.

Although we cannot compare our findings directly to the hearing aid effect research conducted in the 1970s and 1980s due to some methodological differences, we employed an adapted version of the same attributes/adjectives as those original investigations. This observed trend towards increasingly unbiased perceptions is consistent with other similar studies which quantitatively explored the hearing aid effect towards those who wear hearing aids (albeit using images of adults; Clucas et al., 2012; Rauterkus & Palmer, 2014). However, this was in contrast to other relatively recent studies examining the hearing aid effect in a pediatric population, where stigma has been identified (Ryan et al., 2006; Strange et al., 2008).

Interestingly, when comparing responses among the children and their parents, parents rated children wearing hearing aids more positively on all five attributes, and only on two attributes in those without hearing aids. This further proposes the idea that although hearing aids may have an effect on the impressions of adults, children's attitudes towards their peers wearing hearing aids do not differ from those without. It should be noted that the overall higher adult ratings of children without hearing aids might have been due to a response bias. Even though participants were not told the true nature of the study before responding, adult participants may have deduced the study's intentions or have been influenced by the hospital environment when scoring the photos of children wearing hearing aids. This may have led them to respond in a more positive and perceived socially acceptable manner towards these images, rating them higher.

The most obvious potential bias introduced into our study was the hospital environment where we recruited

participants. This may have influenced participant responses as our study population may be more familiar with seeing children wearing medical technology and hence may be more accepting of children who wear visible hearing devices. A way to mitigate this bias from convenience sampling would be to survey adults and parents in diverse settings, such as community centres or schools. Other study limitations include the reliance on participants' self-reported data. Participants may not recall information correctly, such as if they have family members who wear hearing aids, which may bias their opinions and therefore the results of the study. We did not collect participants' ethnic background information, and there may be potential cultural differences, which cannot be elucidated in this design.

Conclusions

Overall, this study demonstrated a lack of negative perception of pediatric hearing aid users in a hospital setting, which may have several larger implications in the general population. The change in impressions towards hearing aids may point to similar trends against stigma for other assistive medical devices. Stigma against patients who use assistive technology has been previously demonstrated, and may be a barrier in patient adherence (H. P. Parette & Scherer, 2004; P. Parette & Scherer, 2004). Although the appearance of other assistive medical devices may not have changed as much as hearing aids have in the past 5 to 10 years, certain lessons can be applied to other supportive technologies in decreasing stigma. Perceptions of different devices may be worth further investigation to see if similar patterns exist. Furthermore, the findings of this study have an impact on the clinical practice of otolaryngologists and audiologists. Although there may be an anecdotal belief of a reduction in the stigmatization of those wearing visible hearing devices, this study provides the first evidence towards this possible trend, which could affect how audiologists and otolaryngologists counsel potentially concerned parents about perceptions of their children who wear a hearing aid (Jackler, 2006). However, more research in the general population outside of the hospital environment would be required before making such assertions.

The most common reason why individuals who have a hearing impairment do not regularly use a hearing aid is due to stigma or embarrassment (Cienkowski & Pimentel, 2001). Now parents and caregivers, in addition to pediatric patients themselves, have some reassurance of a possible decline in negative bias towards the usage of visible hearing devices. The results of this study may encourage more families to use hearing aids for hearing rehabilitation when indicated, which may better facilitate the normal development of these children (Hyde, 2005).

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Authors' Note

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