

## **Hearing protection for clubbers is music to their ears**

Elizabeth Francis Beach, PhD<sup>1</sup>

Warwick Williams, PhD<sup>1,2</sup>

Megan Gilliver, PhD<sup>1,2</sup>

1: National Acoustic Laboratories

2: Hearing Cooperative Research Centre

Name and address for correspondence:

Dr Elizabeth Beach

National Acoustic Laboratories

126 Greville Street

Chatswood NSW 2067

Australia

Ph: +61 2 9412 6983

Fax: +61 2 9411 8273

Email: [elizabeth.beach@nal.gov.au](mailto:elizabeth.beach@nal.gov.au)

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## ABSTRACT

**Issue addressed:** While it is difficult to promote the use of hearing protectors in noisy workplaces and leisure settings some nightclub attendees choose to wear earplugs when exposed to loud music. This qualitative study investigated the perceptions of clubbers about the advantages and disadvantages of earplug use in nightclubs. Such firsthand information could potentially be used to educate non-wearers about the features of different earplug types, the experience of wearing earplugs and their relative merits. **Methods.** Structured telephone interviews were conducted with 20 regular clubbers who wear different types of earplugs at nightclubs. Participants were asked about their experience of wearing earplugs, and in particular, what they perceive to be the advantages and disadvantages of earplugs. **Results.** Participants' responses revealed that cheaper foam earplugs are considered less satisfactory than more expensive earplugs which are relatively discreet and comfortable, facilitate communication with others, create minimal music distortion, and in some cases improve music sound quality. In terms of effectiveness, all types of earplugs were considered beneficial in reducing the after-effects of loud music and providing hearing protection. **Conclusions.** The perceived advantages of earplugs, which are often not recognised by non-earplug wearers, should be communicated in order to encourage the use of earplugs amongst clubbers. **So what?** Loud music poses a risk to the hearing health of those who frequent loud music venues. Providing clubbers with firsthand information about the advantages of wearing earplugs could lead to more widespread use of earplugs by those at risk.

## INTRODUCTION

Since the early 1970s, regulations and education programs have been in place to limit hearing loss from occupational noise exposure [1]. Yet the use of hearing protectors (earplugs and earmuffs) in noisy workplaces remains low [2-5]. There are many factors that affect the uptake of hearing protectors, including discomfort and communication difficulties [6, 7]. Not surprisingly, in non-work or leisure settings, there is also widespread reluctance to wear earplugs amongst people exposed to high noise levels. For example, even though frequent attendance at nightclubs, dance clubs, and music festivals over several years has the potential to make a significant contribution to a person's overall lifetime noise exposure, and in turn increase the risk of noise-induced hearing loss [8-10], the use of earplugs in these environments is uncommon. Only 14% of respondents to a survey on the MTV website reported wearing ear protection in places where loud music was played [11]. Similarly, a survey of staff and patrons of 12 Perth nightclubs found that 17% wore earplugs [12] and 16% of surveyed staff at eight New York nightclubs regularly used earplugs [13]. Earplug use at rock concerts seems to be more variable with reported rates as low as 9.5% for American 17- to 21-year-olds [14] and as high as 61% among Swedish concertgoers of the same age. In Sweden, free or low-cost earplugs are available at concerts and earplug use has been encouraged via several noise-related health campaigns in recent years [14].

Encouragingly, Crandell et al. [15] found that 84.5% of 18-29-year old survey respondents would consider wearing earplugs if they were available at loud venues free of charge, and Chung et al. [11] report that up to 66% of MTV survey respondents could be convinced to try earplugs if they were educated about the permanency of hearing loss. However, convincing clubbers to wear earplugs is considered a difficult task because many young people perceive earplugs as uncomfortable [15, 16], 'uncool' [17, 18], and impacting negatively on communication [16, 19] and music [15, 20-22]. Peer pressure [11], concerns about appearance [20, 23], and lack of knowledge [15, 23] are also barriers to young people wearing earplugs. Many young people simply believe

earplugs are unnecessary [15, 23, 24] perhaps because the potential for long-term hearing damage is considered too distant to be acted upon [25].

It may be that non-wearers could be persuaded to try earplugs if they knew more about how it actually feels to wear them while at a nightclub. To date, few researchers have examined the subjective experience of wearing earplugs in loud music venues. Chesky et al. [26] gave participants Etymotic ETY High Fidelity ER-20 earplugs (Etymotic Research Inc. Elk Grove Village, Illinois, USA) to wear while listening to a 3-minute music recording at 96 dBA LAeq and asked them to complete a series of scales relating to perceived loudness, comfort, ability to communicate and understand lyrics. The results showed that ER-20 earplugs were “generally liked”: They reduced the perceived loudness of the music, improved the wearers’ ability to understand lyrics, and to hear themselves, but decreased the ability to understand others. Although the Chesky et al. study provides some information about the subjective experience of wearing one particular type of earplug in a simulated nightclub environment, it does not arise from the real-world experience of those who voluntarily wear earplugs in nightclubs. Thus, in this qualitative study, a group of clubbers who regularly wear different types of earplugs at nightclubs was asked to share their knowledge of, and experience with, earplugs, particularly the perceived advantages and disadvantages.<sup>1</sup> The aim of the study was to build a detailed account of the subjective experience of wearing earplugs in nightclubs which can be used to educate and inform non-wearers and encourage them to try earplugs for themselves.

## **METHODS**

### **Recruitment**

Approval for this research was received from the Australian Hearing Human Research Ethics Committee. Using a purposive sampling method [27, 28], regular and experienced earplug wearers

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<sup>1</sup> Participants were also questioned about the factors that motivated them to wear earplugs. A detailed analysis of motivating factors will be published separately.

were sought via the internet. First, a message was sent to 67 members of a prominent Australian online dance music community, [www.inthemix.com.au](http://www.inthemix.com.au). The members were selected because they had previously contributed to at least one forum 'thread'<sup>2</sup> stating that they always or often wore earplugs when at clubs and other music venues. This approach yielded 18 interviewees. A further six participants were recruited by posting a message on a general 'inthemix' forum. Thus, a total of 24 clubbers, who regularly wore one of three different earplug types, were recruited.

## **Participants**

Of the 24 participants interviewed, four were excluded because they were not considered regular and experienced earplug wearers: One had worn the earplugs only once, having bought them three weeks prior to the interview; and the other three wore earplugs only at particular venues. The remaining 20 participants confirmed that they always or almost always wore earplugs at loud music venues. Thus, the final sample comprised 20 regular earplug wearers (5 females; 15 males), who had been wearing earplugs for at least three months. Participants were aged between 21 and 42 years, and all were frequent clubbers, who also attended concerts, gigs, and music festivals on a regular basis. Details of participants' attendance at loud music venues are shown in Table 1. The majority of participants had post-secondary qualifications and lived in areas of above-average socio-economic advantage [29], a factor which has been shown to influence the use of hearing protection [30].

--- Insert Table 1 here ---

## **Earplugs used**

Participants reported using one of three earplug types while attending loud music venues: disposable foam earplugs; Etymotic ETY High Fidelity ER-20 earplugs; or custom earplugs, also known as musicians' earplugs. Figure 1 shows that foam earplugs were adopted first by most participants (n= 11), followed by more expensive ER-20 and custom earplugs. However, since first wearing

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<sup>2</sup> A thread is a section in an online forum that comprises all messages posted in response to an initial comment or question posted by a forum member.

earplugs, nine participants had switched to a different earplug type (either ER-20 or custom) as indicated by the dashed lines in Figure 1. Current wearers of ER-20 and custom earplugs tended to be involved in music- and nightclub-related activities, such as audio engineering, live bands, music production, DJing, and club photography, as shown in Table 2.

----- Insert Figure 1 here -----

--- Insert Table 2 here ---

### **Interviews**

Structured telephone interviews, with an average duration of 21 minutes (range: 11 to 29 minutes; SD: 5.1), were conducted by one of the authors (EFB), a psychologist with no experience of wearing earplugs of any type in a loud music setting. Participants were asked a series of questions about their earplug use, clubbing behaviour, and perceived advantages and disadvantages of earplugs. The interview questions, some of which were adapted from Vogel, Brug, Hosli, van der Ploeg, & Raat [31] are shown in the Box below. Eight questions were specifically designed to yield information about the perceived advantages and disadvantages of wearing earplugs, and these are marked with an asterisk.

All interviews were transcribed verbatim and subjected to content analysis whereby participants' statements were coded into seven categories or themes, which emerged from the interviews: hearing protection, effect on music, effect on hearing and communication, discreetness, comfort, cost, and ease of handling. Any and all participant comments that fitted these categories were coded, regardless of the question that prompted the comment. Participants who had experience with more than one earplug type (n=9) were a particularly rich source of information because they were able to compare and contrast different types of earplugs. Once the transcripts were coded, each of the seven categories was examined across the three different earplug types to determine the extent to which each theme applied to each earplug type. Data coding and analysis

was performed using NVivo qualitative data analysis software; QSR International Pty Ltd. Version 8, 2008.

## RESULTS

Participants' subjective perceptions of the advantages and disadvantages of earplugs are presented below under the seven coding categories. The first three themes relate to users' perception of how earplugs affect hearing. The remaining four themes relate to the practical aspects of earplugs. Examples of participant comments are included to illustrate and validate the themes [32] [33].

### Hearing Protection

Without exception, all interviewees nominated protection of hearing and/or alleviation of the after-effects of loud music such as ringing in the ears and headaches as a positive feature of earplugs, e.g.,

*"At the end of the night, I don't come home with ringing ears, and I know that in years to come I will hopefully have protected my hearing." (28-year-old female)*

### Effect on Music

One of the common complaints about earplugs is that they have an adverse effect on music [20, 22], but according to the participants in this study, this is not true of all earplug types. Participants' perceptions of how each of the three earplug types affect music are detailed below.

**Foam earplugs.** Foam earplugs were generally regarded as having a negative effect on music, particularly by those who had progressed from wearing foam earplugs to ER-20 or custom earplugs. The five former foam earplug wearers described the music as sounding "really bassy", "all bass and muddy", "more bass-heavy", "really weird", and "not as coloured". These comments suggest these participants recognised that foam earplugs provide inconsistent sound reduction over the frequency range by attenuating higher frequencies more than low and mid frequencies [22]. Alternatively, the bass effects may have been the result of improperly fitted earplugs creating an occlusion effect

whereby partial closure of the ear canal results in amplification of low-frequency sounds [34, 35]. Whichever explanation is applicable, the bass-heavy sound quality may have contributed to these participants moving on to other earplug types. In contrast to the former foam earplug wearers, four of the six current foam earplug wearers stated that, for them, foam earplugs actually enhance the sound of the music because they improve the balance and clarity of the music, and cut out distortion from systems that are too loud:

*"[Wearing foam earplugs] removes that harsh trebleness from it." (27-year-old female).*

*"It generally sounds clearer because... it cuts out that upper level of distortion so I can hear it better." (23-year-old female)*

**ER-20 earplugs.** Four participants described the effect of wearing ER-20 earplugs as either enhancing the music or having no discernible impact other than dropping the volume to a comfortable level:

*"[Wearing ER-20 earplugs] doesn't really impact the music at all....It's still as clear as it is [without earplugs], just the volume's less." (24-year-old male).*

Comments such as this reveal that although the frequency response of ER-20s is not perfectly flat [35], it is sufficiently consistent that wearers do not notice any disturbance in the spectral balance of the music. The remaining three participants commented that the effect of the ER-20 earplugs was dependent on the sound system: If poorly tuned, then ER-20s could actually improve the sound quality. These comments appear to be valid because they were made by the three ER-20 wearers experienced in audio engineering, music producing, DJing, and playing in live bands.

**Custom earplugs.** The custom earplug wearers in this study believed that their earplugs had little impact on the sound quality of music. Three users stated that custom earplugs improved the music quality, one found no difference, and the remaining three commented that occasionally the music is negatively impacted, but only minimally. These comments are unsurprising given that custom earplugs are specifically designed for listening to music. They provide uniform attenuation across the

frequency range, and thus lower the intensity while preserving the tonal balance of music [22, 36]. Those who pointed out the minimal negative effect of the earplugs believed that this was a small price to pay considering the protection provided by the earplugs:

*“Sometimes I feel like I’m missing out a bit but the trade-off is worth it.” (30-year-old male)*

Regardless of the type of earplugs worn, users, particularly those who had used earplugs for two years or more, reported that they had become accustomed to the effect of the earplugs and they find they can no longer cope with being in a loud music environment without them:

*“I’ve gotten so used to wearing them... I get flustered and annoyed when I don’t have them on.”  
(24-year-old male, has worn custom earplugs for 2 years)*

### **Effect on hearing and communication**

Perhaps the most surprising positive feature of earplugs was their perceived effect on communication. All custom earplug wearers and all but one ER-20 earplug wearer reported that it was easier to communicate with friends when wearing earplugs than not. Several participants expressed surprise at this feature of earplugs, with one user describing it as an “unexpected” and “fantastic bonus”. For foam earplug wearers, perceptions were more mixed. Two users found it more difficult to communicate when wearing earplugs than not, and even though the remainder reported that communication was easier, they reported difficulty regulating the volume of their own voice. For example, several participants reported that they often felt like they were shouting when in fact they were not. This kind of experience is most likely the result of the occlusion effect in which the amplification of low-frequency sounds from the wearer’s voice creates an echo or ‘hollow voice’ effect. [35, 37]

### **Discreetness**

The interviewees’ comments and observations about the relative discreetness of the different types of earplugs were consistent amongst wearers of each earplug type. Participants pointed out that

foam earplugs are often brightly coloured, sometimes fluorescent, and they “stick out” of your ears, making them obvious to others and also resulting in the wearer being more likely to receive comments from other clubbers. In contrast, wearers of ER-20 earplugs commented that they were “pretty unobtrusive”, “usually unnoticeable”, and “quite discreet”. Participants commented on their small size and the clear plastic piece which protrudes only slightly from the ear. Similarly, wearers of custom earplugs considered their earplugs to be less obvious than other types, describing them as: “not quite as visible” and “a bit more subtle”. Some users thought it was unlikely that people could see that they were wearing earplugs because custom earplugs are usually skin-coloured or clear and their flush insertion means they do not protrude from the ears as much as the other two earplug types.

### **Comfort**

Another theme that emerged from the interviews was comfort. Foam earplugs were regarded as less comfortable than the other earplug types, although comments to this effect were mostly from those who had moved on from foam earplugs and now wear ER-20 or custom earplugs. Only two of the six participants currently wearing foam earplugs mentioned discomfort. This incongruence suggests that the former wearers’ discomfort may have prompted them to try alternative earplug types. ER-20 earplugs were labelled as “comfortable” by some current wearers but others pointed out that they can become uncomfortable after an extended period of time. Wearers of custom earplugs found them to be generally comfortable although one user mentioned that there is an initial “settling-in period” and that it takes some time to get over the initial feeling of having a “full” ear. Overall, despite any discomfort experienced when wearing earplugs, users felt this inconvenience was manageable given the hearing protection afforded by earplugs:

*“Especially with a festival, wearing them [ER-20 earplugs] all day long or all night it can get a bit uncomfortable on the ears. But it’s still a small price to pay.” (24-year-old male)*

### **Cost**

Although the cost of earplugs was not mentioned by all participants, those who did raise the issue expressed clear views. Participants described foam and ER-20 earplugs as “inexpensive” or “cheap”. This is particularly true of foam earplugs, which can be purchased in bulk for as little as \$AU0.25 and ER-20 earplugs are available online for around \$AU14. In contrast, custom earplugs, are considerably more expensive, costing between \$AU180 and \$AU220. Several custom wearers suggested that cost may be a barrier preventing others from wearing earplugs, and this view was mirrored by three of the six foam earplug users, who expressed a desire to upgrade to “proper” earplugs, and cited cost as the reason they haven’t yet done so. Because of the cost of custom earplugs, several participants mentioned their fear of losing them. Overall, there was a feeling that despite the cost of custom earplugs, it was a worthwhile expense:

*“Really, it’s your hearing so it’s probably not that expensive.” (31-year-old female);*

*“Looking back ... I would happily pay that [the cost of the custom earplugs] again the minute I lost them.” (24-year-old male).*

### **Ease of handling**

Although perhaps less important than the other issues raised above, a number of participants made comments about the relative convenience and ease of handling of earplugs. For example, some participants found ER-20 plugs difficult to clean:

*“They [ER-20 earplugs] are quite delicate little things so I’m always afraid to wash them.” (27-year-old male)*

Others were enthusiastic about the fact that ER-20 earplugs come with a small carry case that can be conveniently clipped onto a key ring.

*“They came in a little soft plastic case with a little chain on it that I could put on my keys, so ... I took them everywhere I went.” (27-year-old male)*

## DISCUSSION

This study examined the subjective experience and perceived advantages and disadvantages of three different earplug types worn by regular clubbers. According to the participants, custom earplugs offer several advantages because they are discreet, comfortable, allow communication with others, create minimal music distortion, and in some cases improve music sound quality. The main drawback of custom earplugs was their cost, being substantially more expensive than other earplug types. ER-20 earplugs were also well liked by participants in this study. Users found them comfortable unless worn for more than several hours and more discreet than foam earplugs. It was reported that ER-20 earplugs enabled communication with others, and had little or no impact on music quality. Although they were considered difficult to clean and less discreet than custom earplugs, the ER-20 earplugs come in a convenient carry case, and sell for around 10% of the price of custom earplugs. The cheapest option, foam earplugs, were reported to suffer from lack of discreetness, reduced comfort, music distortion, and were not conducive for communication amongst all wearers. These disadvantages concur with previous research [22, 38], however, foam earplugs are considerably cheaper than both ER-20 and custom earplugs, and clearly their drawbacks are such that certain participants in this study were willing to tolerate them because of the protection they provide and their ability to stop the “hearing hangover”. Importantly, in the opinion of the interviewees, all earplugs were considered effective both in reducing the after-effects of loud music and providing hearing protection.

The perceived relative merits of the three different earplug types correspond well with both cost and the pattern of uptake of earplugs. That is, most earplug users started with the cheaper, less satisfactory foam earplugs and progressed to either ER-20 or custom earplugs, particularly those involved in activities such as music producing and DJing. Once users had worn ER-20 or custom earplugs, none reverted to wearing foam earplugs, which suggests that the advantages of these earplug types outweigh the additional cost. Interestingly, however, two participants who had

previously tried custom earplugs had reverted to ER-20s. One user had lost the custom earplugs and was using ER-20s as a stop-gap before buying a replacement pair, while the other user stated a preference for the ER-20s over the custom earplugs. Although it is not possible to draw firm conclusions based on this small sample, the experience of these participants suggests that ER-20 earplugs may be a viable and affordable alternative to custom plugs.

Some of the views of the ER-20 wearers in this study are reflected in the results of Chesky et al. [26], who also found that ER-20 earplugs reduced the perceived loudness of the music, made lyrics clearer, and also made it easier to hear one's own voice. However, participants in the Chesky et al. study experienced difficulty understanding others, a result that is at odds with the views of the ER-20 wearers in this study. Those in the Chesky et al. study may have experienced difficulty understanding others simply because they were inexperienced ER-20 earplug wearers, and with only 3 minutes exposure, had not had sufficient time to adjust to the effect of ER-20s on their hearing. The ER-20 earplug wearers in the current study, on the other hand, had been wearing them for an average of 4.3 years and therefore had ample time to get used to the effect of the earplugs on hearing and communication in loud music environments.

In terms of comfort, Chesky et al. [26] reported that when participants were questioned a week after their first exposure, having used the earplugs for an average of 4 hours, the earplugs were not considered as "painless" as they had been during the initial experience, but they were rated significantly higher on five of 10 comfort-related scales. Again, this suggests that experience may play a significant role in how earplugs feel. It may be that the sustained, regular use of earplugs by participants in the current study has contributed to their positive perception of earplugs. Indeed, the concept of "getting used to" earplugs was mentioned by seven interviewees across all earplug types, suggesting that persistence with earplugs may be required if users are to overcome any initial discomfort or communication difficulties. More research into this issue is needed, but encouraging

new users to persist with earplugs may be an important factor in generating more widespread use of earplugs amongst clubbers.

Access to effective and affordable hearing protection is important for clubbers because high noise levels at Australian nightclubs are commonplace [10, 12] and there is little incentive for venues to reduce them. Australian environmental legislation requires that noise emitted from venues is inoffensive, but makes no mention of noise levels within venues. Health and safety legislation focuses on the hearing health and protection of employees, and does not explicitly extend to patrons. Thus, clubbers are left to take responsibility for their own hearing protection. Although only a minority of clubbers currently wear earplugs, the regular earplug wearers studied here believe that earplugs, particularly ER-20 and custom types, have several advantages in addition to hearing protection: the ability to enhance the wearer's enjoyment of music and enable communication, as well as discretion and comfort. Yet, these advantages are not recognised by non-earplug wearers, many of whom believe that all earplugs have a negative impact on music, communication, appearance, and comfort [15, 16, 39]. If the proportion of clubbers wearing earplugs is to increase, then it is essential that as many clubbers as possible are made aware of the advantages of the different earplug types.

Devising the best method for imparting a positive message about earplugs requires creativity to ensure it is effectiveness. Education campaigns delivered to teenagers in a school-based setting are not particularly effective in changing protective behaviour [40, 41]. However, web-based and peer-to-peer methods [11], and recommendations from health professionals have the potential to change hearing protection behaviour [24]. Thus, it is suggested that these avenues be used for spreading the message about the advantages of earplugs to non-wearers. If the use of earplugs increases, then the potential for the message to spread via word of mouth between peers in the clubbing community will also increase. Perhaps, in time, earplugs will become a vital accessory, not

only for serious clubbers such as those in this study, but even occasional clubbers who want to enjoy music, talk to their friends, and protect their hearing all at the same time.

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## **Text Box**

### **Interview topics**

#### **Earplug Use**

- Frequency and circumstances of earplug use
- History of earplug use
- Motivation for earplug use
- Advantages and disadvantages of earplugs
- Others' perception of earplugs

#### **Sharing the message**

- How to encourage others to wear earplugs

#### **Attendance at Loud Music Venues**

- Frequency and duration of attendance at venues
- Noise levels at venues
- Exposure to other sources of noise

#### **Attitude Towards Noise**

- Preferences for loud music

#### **Hearing Loss Vulnerability/Severity**

- The effect of loud noise on hearing

- Symptoms of noise damage
- Anxiety about hearing loss
- Importance of hearing

**Efficacy**

- Usefulness and effectiveness of earplugs
- Responsibility for hearing loss

Table 1: Participants' attendance at loud music venues

<b>Pattern of Attendance at Loud Music Venues</b>	<b>Mean</b>	<b>Range</b>	<b>SD</b>
Current age (in years)	28	21 – 42	6
Earliest age of attendance at loud music venues	18.1	16 – 21	1.3
No. of years attending loud music venues	10.0	3 – 25	6.3
No. of years wearing earplugs at loud music venues	4.2	0.25 – 14	3.7
No. of weekly visits to loud music venues	1.0	0.3 – 2.5	0.6
No. of hours per visit at loud music venues	5.1	3.5 – 7	0.8

Table 2: Number of participants involved in music- and nightclub-related activities

Earplug Type	No. of participants involved in music- and nightclub-related activities:								Total	
	DJ	MP	DJ, MP	DJ, MP, AE	DJ, LB	DJ, LB, MP	DJ, LB, AE	CP		
Foam	1								1	2 / 6
ER-20s		1			1		1		1	4 / 7
Custom	2	1	1	1		1				6 / 7

,DJ = disc jockeying, MP = music production, AE = studied audio engineering, LB = live bands, CP =

club photography

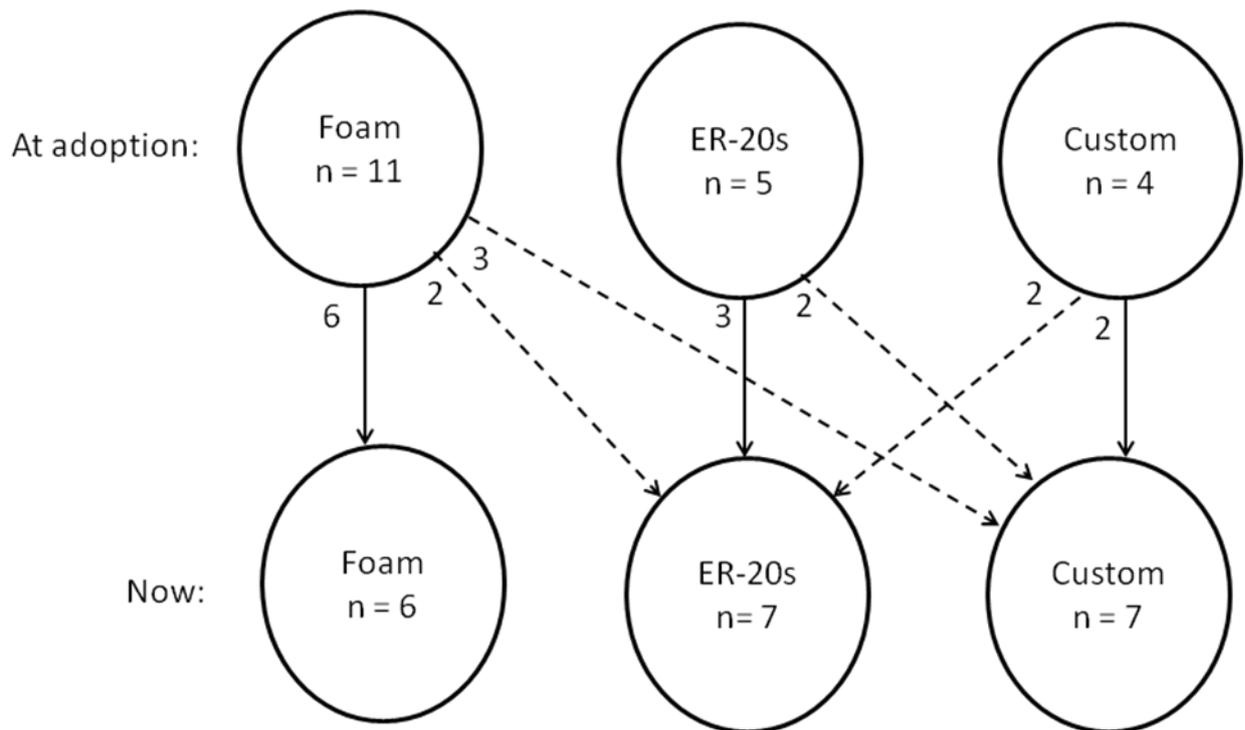


Figure 1: The type of earplugs worn by participants initially and currently. Dashed lines indicate where users switched to a different earplug type.