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WHO-ITU Consultation on Make Listening Safe 8 June

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Review and Preview

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The Global standard for safe listening devices and systems: current status and future plans

The Global standard for safe listening devices and systems: current status and future plans

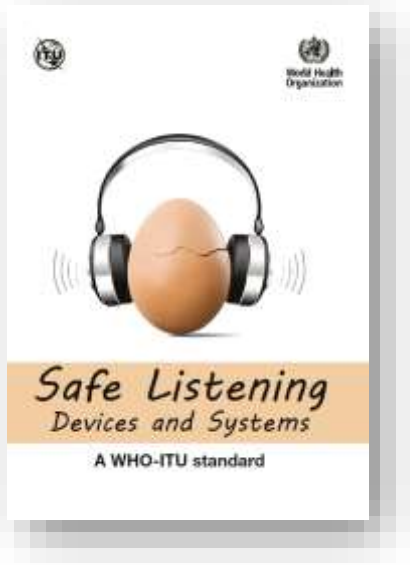
Masahito KAWAMORI
Rapporteur
Q28/16 (digital health)
ITU-T

ITU-T Study Group 16

- ICT standardization sector of International Telecommunication Union
- Lead group for multimedia such as audio, video etc.
  - Well-known standards such as H.264 and H.265 (HEVC)
- E-health, digital health and telemedicine are important areas where multimedia and ICT can contribute (Question 28 is tasked with the work)
- Close collaboration with WHO
  - Focus Group on AI for Health
  - Joint work on “Make Listening Safe” Initiative
- As the oldest international organization, ITU provides a forum for discussion among private sectors, governments and UN agencies

A WHO-ITU standard

- ITU: “Recommendation ITU-T H.870 (2018-08), Guidelines for safe listening devices/systems”
- WHO publication: “Safe listening devices and systems”
  - **Free** publication
- It has the same level as ISO and IEC de juris standards



WHO/ITU H.870: Scope

- Describes the requirements on safe listening devices and systems, especially those for playing music, to protect people from hearing loss.
- Version 2 has expanded its scope to include wireless head-sets
- For the purposes of this Recommendation, the following types of devices are excluded:
- Two-way communication devices (such as walkie-talkies, etc.);
- Rehabilitative and medical devices (e.g., hearing aids, FM systems and other assistive listening devices (ALD) approved as part of hearing aid and cochlear implant systems, etc.);
- Personal sound amplification devices;
- Professional audio equipment and devices.
- NOTE – There has been discussion on the exposure to sound from e-gaming

Personal Audio System

Personal Audio Device

Listening Device

Personal Audio System (H.870v2)

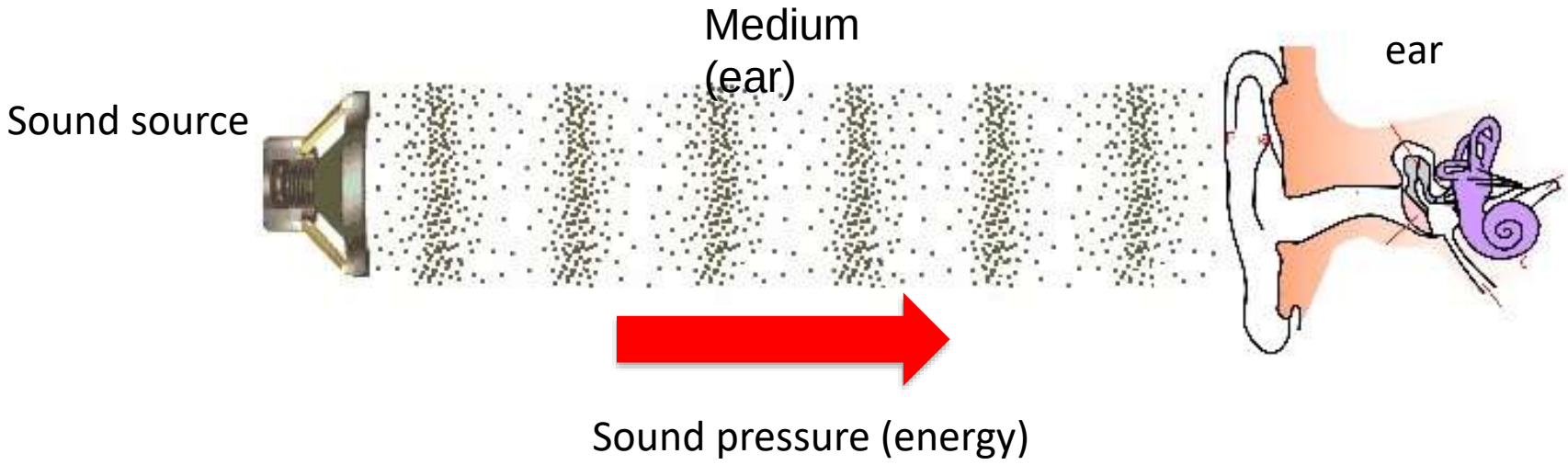
What's in WHO / ITU H.870?

- Introducing "**equal energy principle**" and **dosimetry**
- A new unit of sound exposure **Pa²h (*pascal squared hour*)**
- Recommending **2 modes of Safety levels**
- Guidance on **health communication** on personal audio devices
  - General information (how to listen safely, risk awareness, etc.)
  - General usage reporting (average levels, how much listening in a day & week)
  - Types of **warnings** when user reaches 100% of weekly allowance
- Gives **further guidance**: ambient noise control (e.g. noise cancelling) & parental control

Equal Energy Principle and Dosimetry

Basics: Sound

- Sound is propagation of energy (pressure) through medium (e.g., air), received by ear.
- Sound energy and pressure are usually associated with “loudness”
- Excessive energy (pressure), i.e., loud sound, received by ear can result in hearing damage
- Air pressure is commonly expressed in Pa (*Pascal*).
  - E.g., Hurricane Katrina in 2005 had 902 hPa (hectopascal) or 90,200 Pa
  - 2,600 Pa is the pressure to make water boil at room temperature



Definitions of decibel

- Conventionally, sound energy is expressed in terms of decibels
- There are many definitions of (different types of) “decibel” (dB), which makes things a bit confusing
  - **dB** - a relative logarithmic value used to express the ratio of one value of to another
  - **dB SPL** (Sound Pressure Level): the ratio of given sound pressure and a reference pressure, 20μPa (minimal pressure that a human ear can detect at 1kHz).

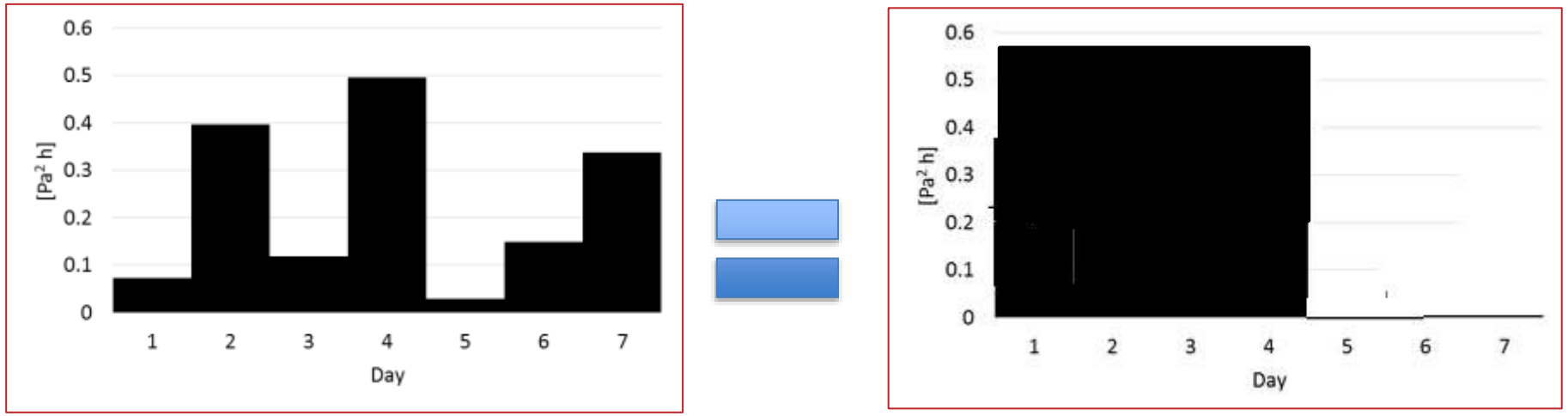
Important to note that it is not a simple linear absolute value

Decibels and Pressure

- Human ear is extremely sensitive
- Sound pressure expressed in Pa (*Pascal*) makes it easier to appreciate this fact
  - 0 dB (SPL) = 0.00002 (=20 x 10^{-6}) Pa
  - 20 dB (SPL) = 0.0002 Pa
  - 40 dB (SPL) = 0.002 Pa
  - 60 dB (SPL) = 0.02 Pa
  - 80 dB (SPL) = 0.2 Pa
  - 94 dB (SPL) ≒ 1 Pa
    - (Pressure exerted by a US dollar bill resting flat on a surface)
  - 100 dB (SPL) = 2 Pa
  - 140 dB (SPL) = 200 Pa = 10^7 (10 million) times the threshold of sound/hearing (10 thousand times more pressure than ordinary conversation)

Equal Energy Principle

- The premise that equal amounts of sound energy will cause equal amounts of sound induced hearing loss regardless of the distribution of the energy across time.
- I.e., the total effect of sound is proportional to the total amount of sound energy received by the ear, irrespective of the distribution of that energy in time
- “Less energy for longer period of time” “More energy for shorter period of time” Can have the same effect on ear



Dosimetry

- Based on the Equal Energy Principle, a 'dose' of sound energy is defined as the squared A-weighted sound pressure, pA, integrated over the exposure time $T=t2-t1$.
- $$dose = \int_{t1}^{t2} (p_A(t))^2 dt$$
- Simply put, “dose” is (the energy of) Sound Pressure Level integrated over the duration of the exposure:
- Unit is Pa²h (*pascal squared hour*)
  - Use L_{EQ} and dB (SPL)A for reference

- This is line with other sound dose management standards:

IEC 62368-1:2018 and EN 50332-3:2017

Relationship between dB(A) and Dosage

Mode1

dB(A)	Weekly (1.6 Pa^2h)
107	4.5 min
104	9.5 min
101	19 min
98	37.5 min
95	75 min
92	2.5 h
89	5 h
86	10 h
83	20 h
80	40 h

Mode2

dB(A)	Weekly (0.51 Pa^2h)
107	1.5 min
104	3 min
101	6 min
98	12 min
95	24 min
92	48 min
89	1 h 36 min
86	3 h 15 min
83	6 h 24 min
80	12 h 30 min
77	25 h
75	40 h

Acceptable levels of risk for Safe-listening

- It is recommended that PAS includes a system (dosimeter) that tracks the user's exposure time and estimates sound level and the percentage that has been used up of a reference exposure limit (sound allowance).
- References are as follows:

    - **Mode 1: (WHO) standard level for adults: this will apply 1.6 Pa^2h per 7 days as the reference exposure.**
        - **Suited for general public**
    - **– Mode 2: (WHO) standard level for sensitive users (e.g., children): this will apply 0.51 Pa^2h per 7 days as the reference exposure.**
        - **Suited for children and other sensitive individuals**

Other features of H.870

Guidance on **how to communicate** with users of personal audio devices

- Keep record of usage information and provide personalized recommendations & cues
- General information (how to listen safely, risk awareness, etc.)
- General usage reporting (average levels, how much listening in a day & week)
- Types of warnings when user reaches 100% of weekly allowance

Gives **further guidance**: ambient noise control (e.g. noise cancelling) & parental control

Importance of Health Communication

- How to convey the message to the user
- What message to be conveyed:
  - *Risk information,* i.e. information about behaviours (and sounds) that put users at risk of hearing loss
  - *Usage information,* i.e. a personal listening profile and risk information (for example, through a dosimeter to check their decibel levels and sound-dose details)
  - *Concrete recommendations*, i.e. instructions on how to practice safe listening (for example, in the form of cues for action)

Adoption of H.870

- Available in 5 languages
- Already implemented by some manufacturers worldwide
  - Dosimeters are implemented by several organizations
- Referenced by other standards and specifications globally
  - Other specifications for e.g., PSAPs (personal sound amplifying products) are referencing H.870 and adopt some of its recommendations
- Strongly promoted by World Hearing Forum (WHF)
  - Involving the music industry and device manufactures to promote the standard as well as “Make Listening Safe” initiative

Some topics for future study in H.870

- Gaming devices
- VR/AR/MR/XR
- Sensitivity range and frequency response of headphones
- Profiles for different categories of PAS
- Uncertainties in dose estimation
- …

Conformance Testing Specification for WHO-ITU Standard H.870

- HSTP.Conf-H870 “Conformance Specification for H.870” is drafted to provide a set of conformance testing requirements of H.870
- A “check-list” for implementation
- It accompanies H.870 to comprise a “Conformance Test Tool”
- **Call for “testing labs” is under way**

Further Related Work

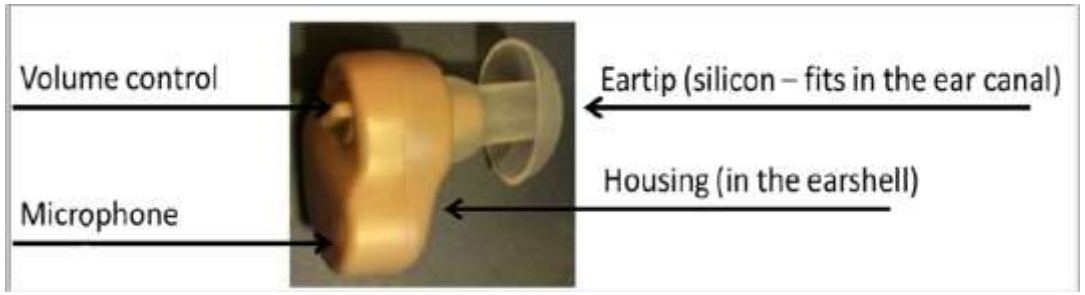
Personal sound amplification products

- Wearable electronic products or application on a wearable smart device (e.g. a mobile phone) that is **not** intended to compensate for impaired hearing, but rather is intended for non-hearing impaired consumers to amplify sounds in the environment for a number of reasons, e.g.
    - Recreational activities
    - Selective hearing in noisy environments
- **PSAP**s are off-the-shelf, non-regulated devices with a varying range of features
- Currently there are no international standards on the safety of PSAPs
    - Levels, exposure
- ITU-T's Recommendation F.781 "*Safety requirements for personal sound amplifiers*" is the first technical standard to address this issue, approved in July 2019
    - Project leaders: European Federation of the Hard of Hearing (EFHOH), European Association of Hearing Aid Professionals (AEA).
- Based on the same principle as ITU / WHO H.870
- Conformance testing specification under development

Standard on Personal Sound Amplifier

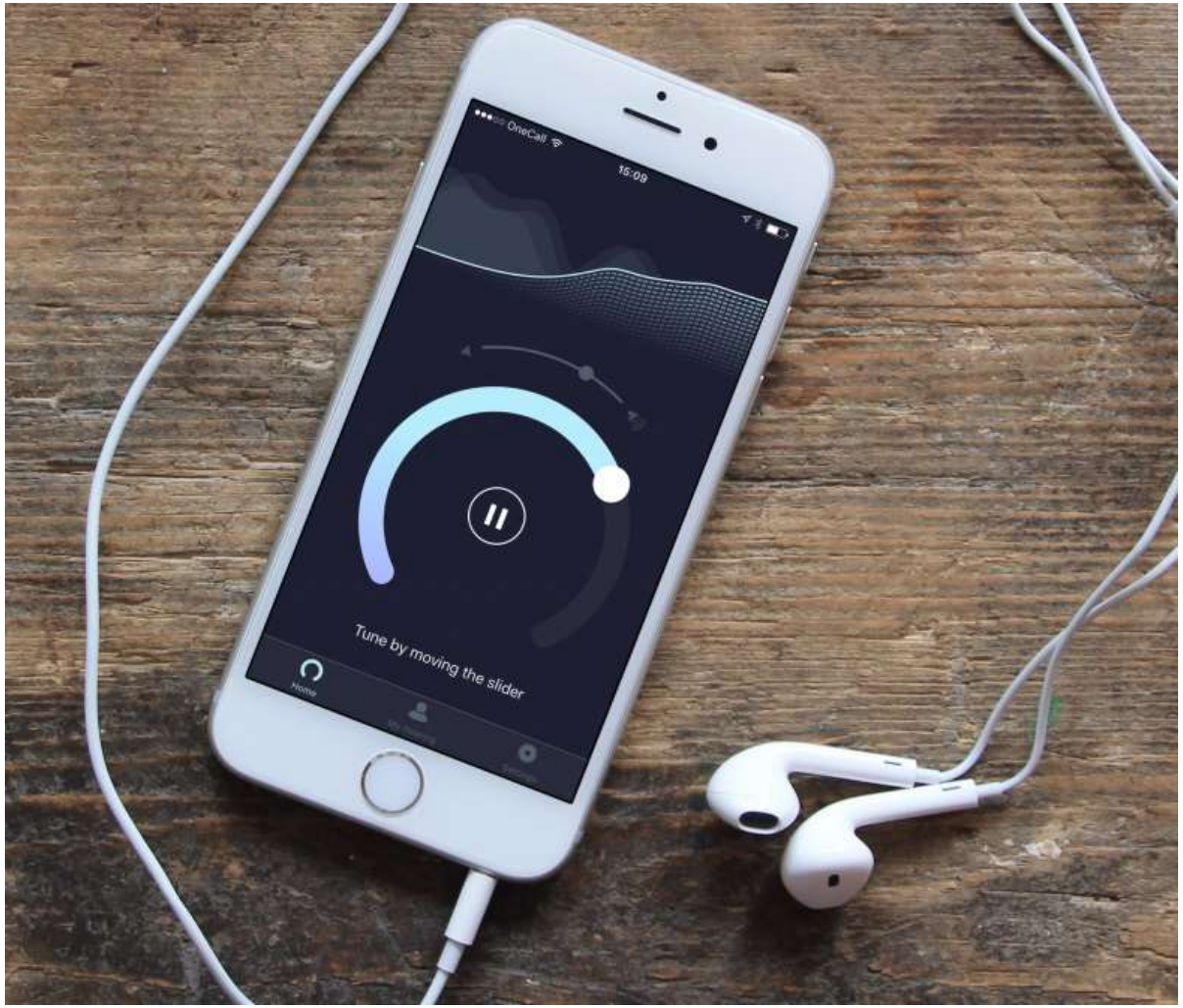
- Personal Sound Amplifier is a wearable electronic product (PSAP) or application on a wearable smart device (PSAA) that is not intended to compensate for impaired hearing, but rather is intended for non-hearing impaired consumers to amplify sounds in the environment for a number of reasons, such as for recreational activities.
- Currently there is no International standard on the safety (volume, etc.) of PSAs
- ITU-T's new draft Recommendation is to address this issue
- Proposed and drafted by European Federation of the Hard of Hearing (EFHOH) and the European Association of Hearing Aid Professionals (AEA).
- Based on the same principle as H.870

Personal Sound Amplifier



- PSA looks like a hearing aid, a **medical device**
- PSAs are not intended to be used for persons with hearing problems
- PSAs are readily available in the market, priced from around $10 USD up to $400 USD.
- Some people, indifferent to the difference, sometimes led to using PSAs in place of hearing aids to compensate their hearing
- This is a very dangerous situation

PSA on a smartphone



- Recently more and more audio enhancing apps are available in the market.
- This situation is becoming more like that PAS (though the user base is much smaller)

New work Item on Guidance for safe listening venues

- Sound levels and acoustics
- Rest zones
- Earplugs
- Information and announcements

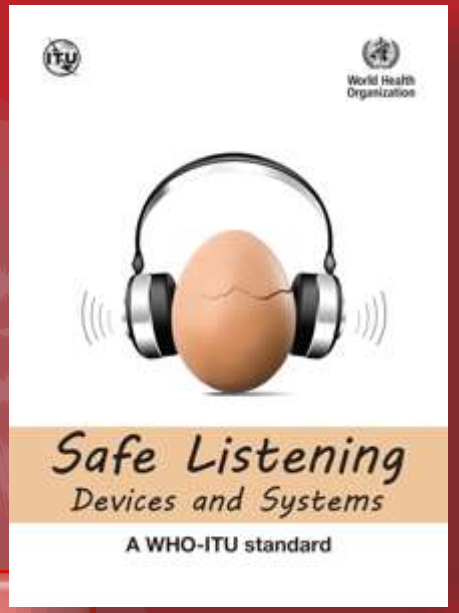
- WHO created a global standard for recreational sound in entertainment venues
  - Different components are identified (e.g. type of venues, sound limits, quiet spaces, hearing protection, warning messages and monitoring)
  - WHO will explore on identification of information needs, collection of existing evidence and collaboration with experts towards development of guidelines for sound exposure in recreational venues
- ITU has decided to create a Technical Paper based on the new WHO standard

Future Work

- Discussion on H.870-V3
- Conformance Testing Spec. H.870-V2
- Conformance Testing Spec. H.871
- Work Item on E-gaming
- Technical Paper on new devices
- Other environments for safe-listening.
- …

- Thank you!!

WHO-ITU global standard for safe listening devices, 2019



Monitor and display	Offer volume limiting options	Inform
- Volume levels (in dB) - Time spent listening - Use of sound allowance	- Automatic volume reduction - Password-protected volume control	- Regarding personal sound use - Give personalized warnings, messages and cues for action

https://www.itu.int/rec/T-REC-H.870-201808-I/en
https://www.who.int/publications/i/item/safe-listening-devices-and-systems-a-who-itu-standard

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Safe and sound: implementing safe listening features into personal devices

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Safe listening: findings

Update on the Apple Hearing Study – 2023

Rick Neitzel **Lauren Smith**
Linyan Wang Abas Shkembi Xin Zhang Ying Tang Glen DePalma Sharon

M | EHS

M | SCHOOL OF
UNIVERSITY OF MICHIGA

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Discussion

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The Global standard: why and what?

WHO Global Standard for Safe Listening Venues

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Why?

Sound levels at entertainment venues are often >100dB

People visiting these venues at a regular basis face the risk of hearing loss

>48% of young people are likely to be at risk of hearing damage due to unsafe exposure at entertainment venues.

In places where regulations have been implemented, these have been effective in lowering sound exposure and risk.

Existing regulations

Developing the standard

Gathered evidence

Expert inputs

Global standard for safe listening entertainment venues and events

Limiting sound level below 100LAEq$_{15}$ min	Monitoring sound levels	Optimizing venue acoustics and sound systems	Making personal hearing protection available	Access to quiet spaces	Provision of training and information

Feature 1:
Sound level limit

Sound level below 100 dB $L_{Aeq,\ 15\ min}$

- Feature 1 specifies an upper limit for the sound level at venues and events.
- Keeping the sound level below the limit makes for a safer and more enjoyable experience for the audience.
- The sound level limit applies at a defined reference measurement position within each venue or event.
- The limit is an upper limit, not a desired target; a sound level significantly below the limit would be suitable for many venues and events.
- A reduced limit should be implemented for events targeted at children.
- It is important to identify, for each venue or event, who has responsibility for ensuring that the sound level is kept below the limit.
- Grassroots venues may need significant support to be able to comply with the limit.

Feature 2: Monitoring of the sound level

The sound level has to be actively monitored to ensure compliance with the limit of 100 dB $L_{Aeq,\ 15\ min}$

- Feature 2 describes how sound levels should be monitored at venues and events.
- Requirements for accuracy and calibration of measurement equipment and record keeping are explained.
- Procedures are given for applying a correction where the sound level cannot be directly measured at the reference measurement position.

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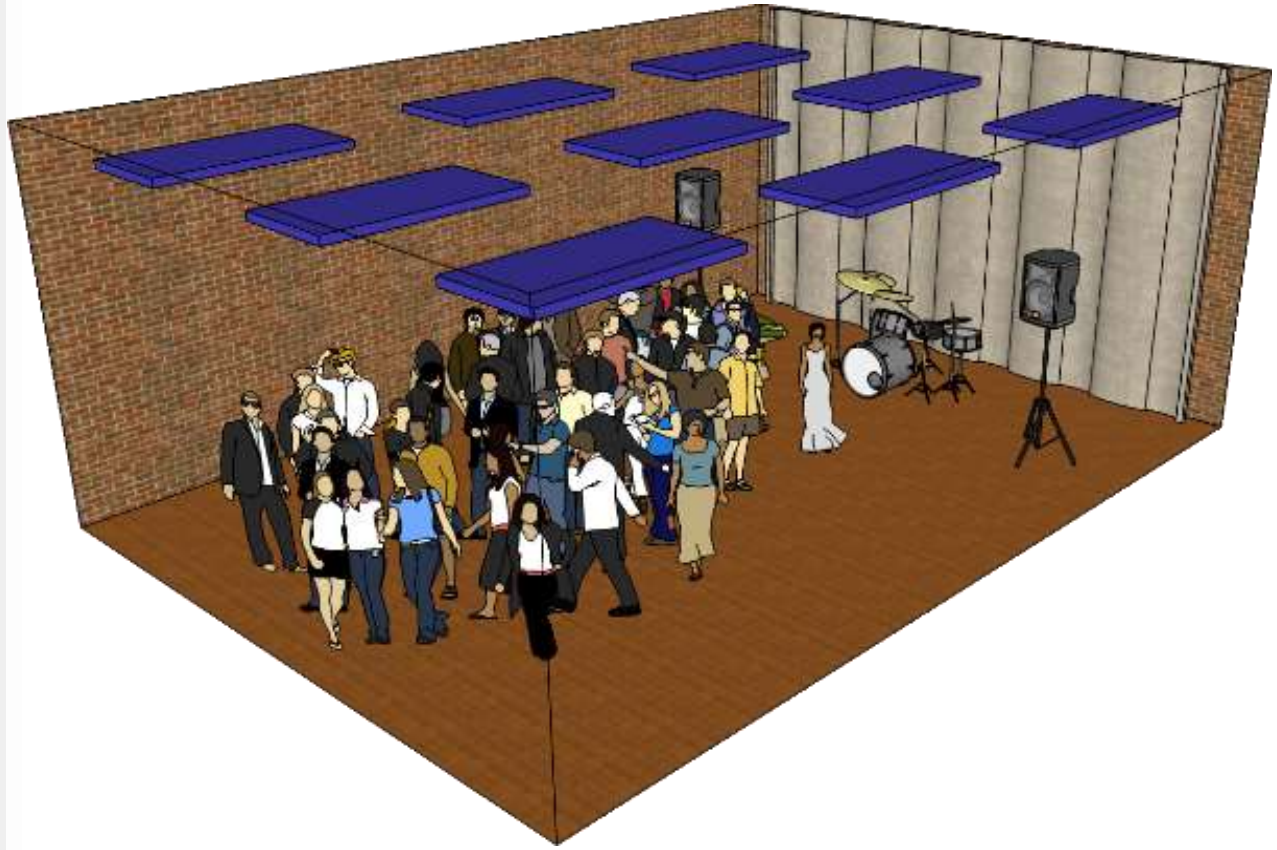
Equipment for:

- Calibration
- Measurement location
- Record keeping

Feature 3: Venue acoustics and sound-system design

Venue acoustics and sound systems should be optimized for safe listening, so far as is reasonably practicable

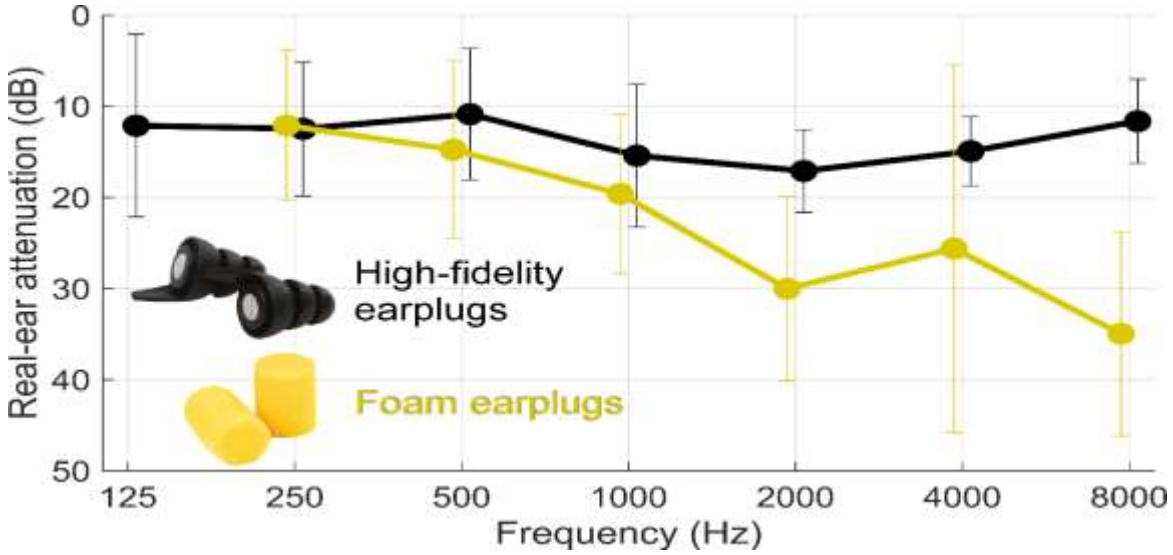
- Feature 3 ensures that the acoustics of a venue and the design of the sound system support safe listening.
- Optimizing the acoustics and sound system for safe listening improves sound quality and enhances the listening experience for audience members and performers.
- High-level design goals for venue acoustics and sound systems are discussed, along with general tips and advice on how these goals can be achieved.
- Sound levels increase rapidly immediately in front of loudspeakers, so audience members should be prevented from approaching the loudspeakers whenever possible.
- Effective management of on-stage sound levels is crucial to achieving safe listening conditions in small live-music venues.



Feature 4: Personal hearing protection

Personal hearing protection should be available to audience members at the venue/event

- Feature 4 ensures that audience members have access to personal hearing protection at venues and events.
- While low-cost disposable earplugs can offer effective protection, high-fidelity earplugs designed for music offer better sound quality, comfort, and useability.
- Adequate instructions should be provided alongside hearing protection, since earplugs are only effective when worn properly.



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Feature 5:
Quiet zones

A designated quiet zone or zones will allow audience members to rest their ears from high sound levels

- Feature 5 provides a place for audience members to go to give their ears a rest from high levels of sound.
- Guidance is provided on suitable acoustic conditions and ambient sound levels in quiet zones.
- Alternative ways of offering periods of respite from high sound levels are suggested where venues cannot accommodate a quiet zone.

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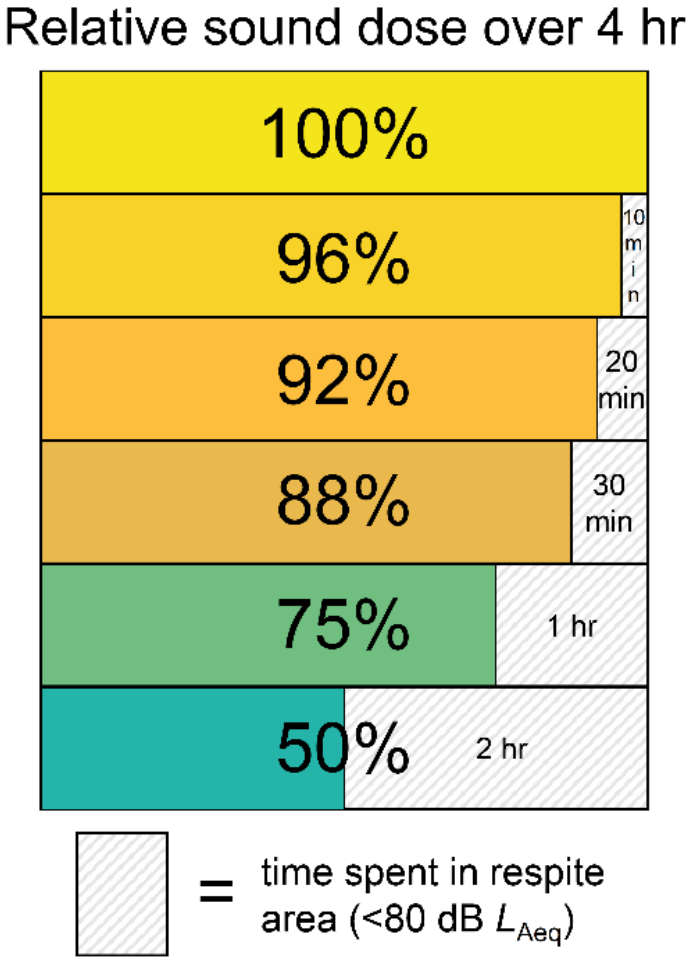

Feature 6: Provision of training and information

Appropriate training and information about safe listening is needed and must be provided

- Feature 6 aims to make staff and audience members aware of the practical steps that can be taken to make listening safer and the importance of doing so.
- All staff in managerial, technical, and patron-facing roles should have a basic awareness of the safe listening measures in operation at the venue or event.
- More in-depth training is required for individuals who have responsibility for monitoring and controlling the sound level.
- Audience members should be provided with information about safe listening on tickets and on notices at the venue or event.
- A venue or event that has been certified by a competent authority as adequately implementing the features of this Standard may identify as a “safe listening venue” or “safe listening event”.

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Adoption and implementation

Adoption and implementation by governments

Voluntary adoption by owners and managers of entertainment venues and events

Schools of music and other institutions with education or training programmes on acoustics, sound engineering, and sound level management; as well as industry associations

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Thank you!

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Setting the Stage: Leveraging live venue and event standards

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Discussion

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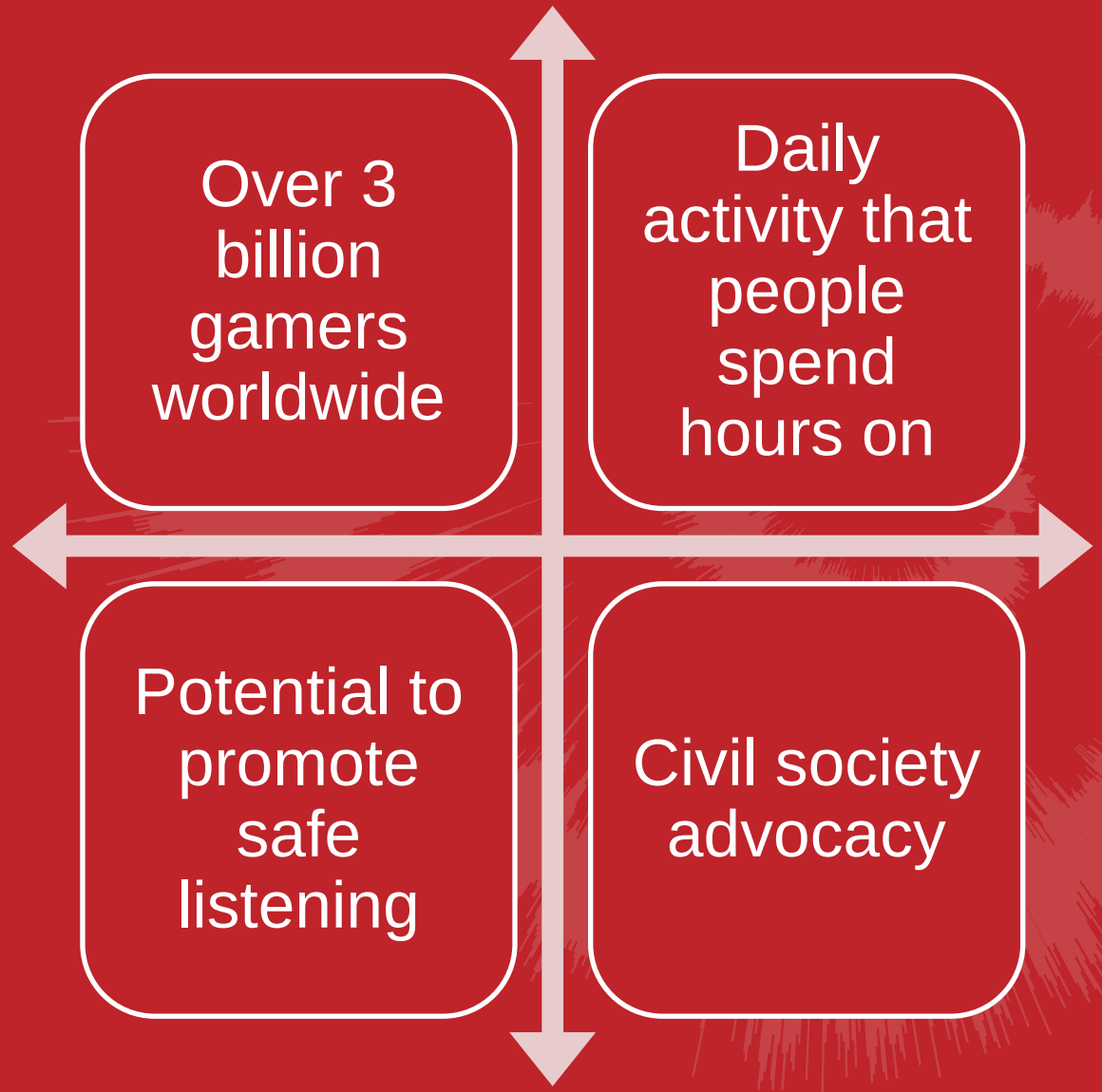
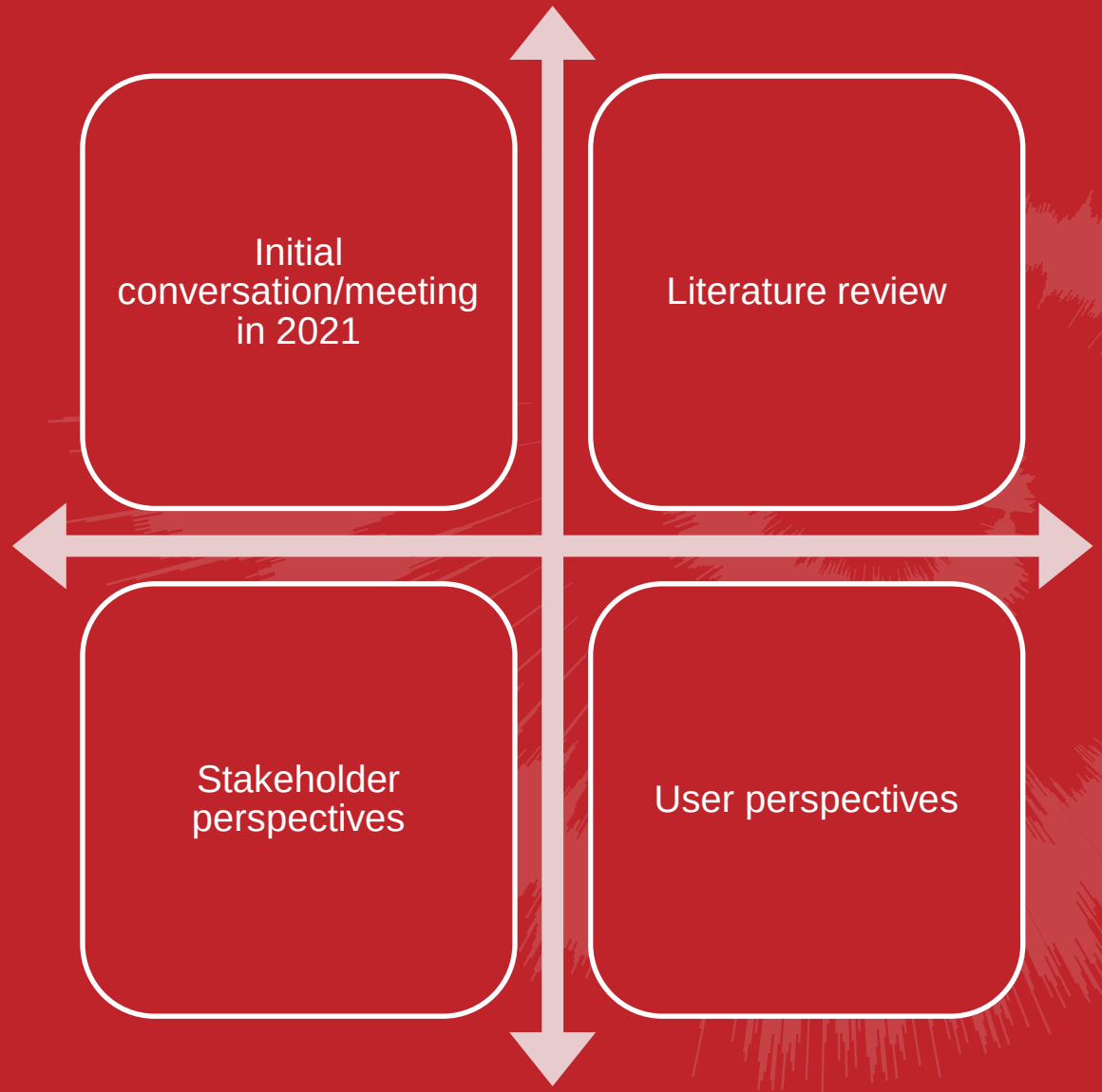
Safe listening in gaming and esports: what do we know?

Why gaming and esports



How?


Initial conversation/meeting in 2021
Literature review
Stakeholder perspectives
User perspectives

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Gaming, esports and hearing: what does literature say?

Gaming, esports and hearing: What does literature say?

Lauren K Dillard, PhD, AuD

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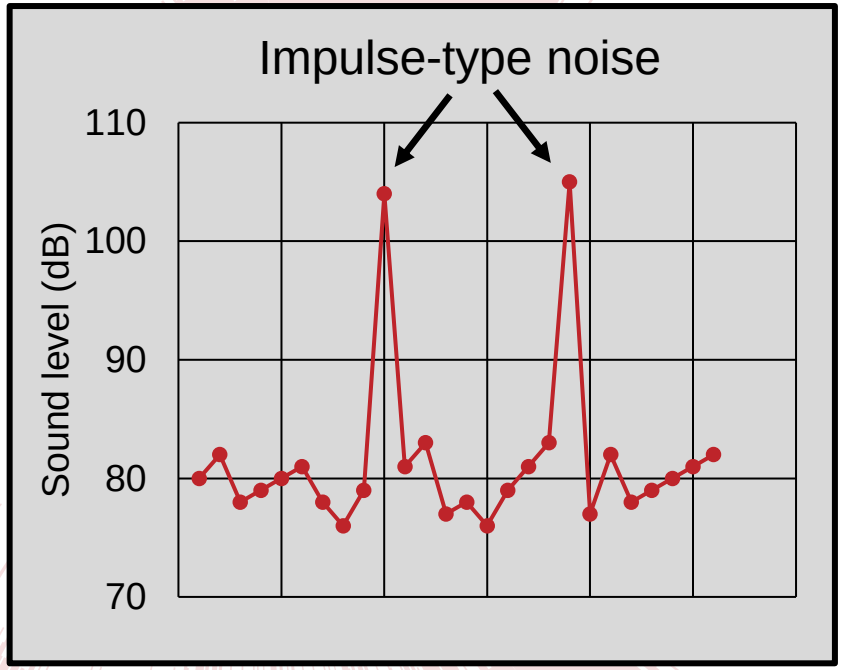
How might gaming lead to hearing loss?

- Games played at ***loud volumes*** and for long ***duration of time*** can exceed permissible levels
- **Impulse-type noise** can lead to acute acoustical trauma and additional impacts on hearing
- More than **3 billion gamers** worldwide



Starck 2003; Statista 2023

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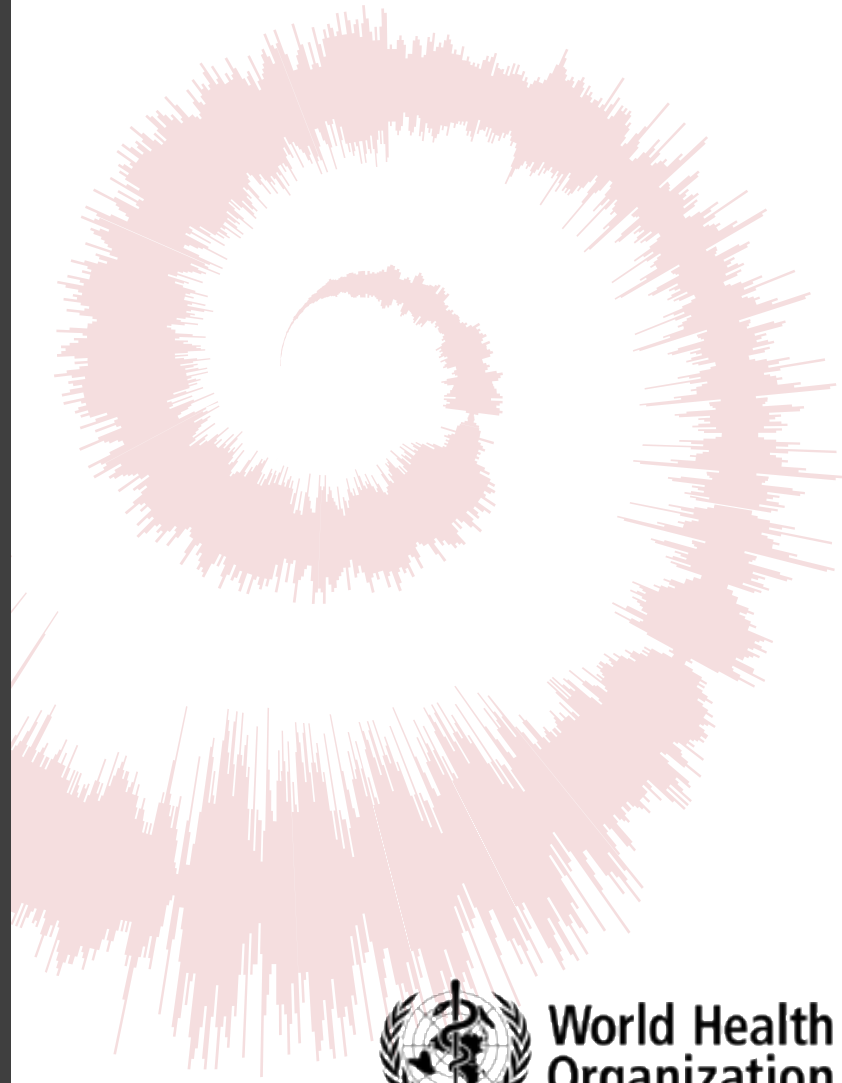
Purpose and approach

Purpose: Synthesize evidence related to relationships between gaming and hearing loss and/or tinnitus.

Approach: Systematic scoping review



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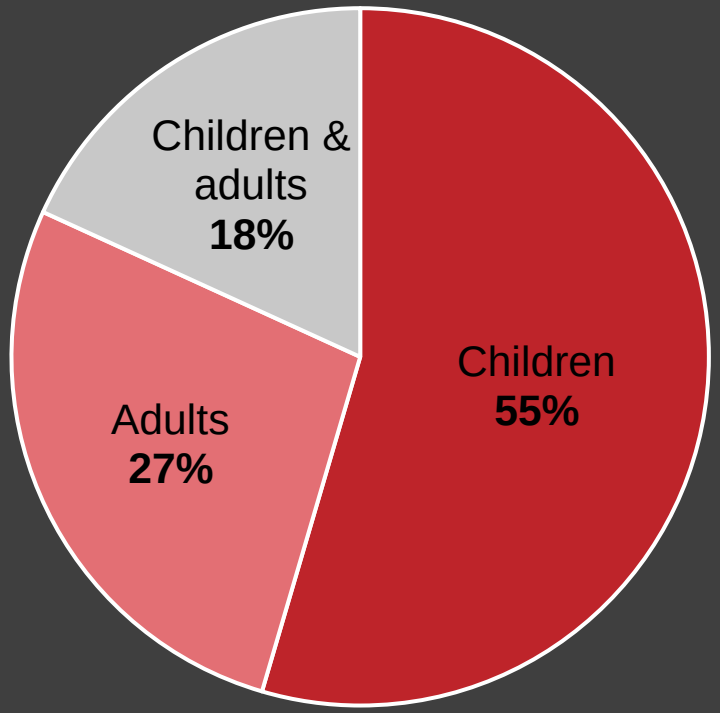
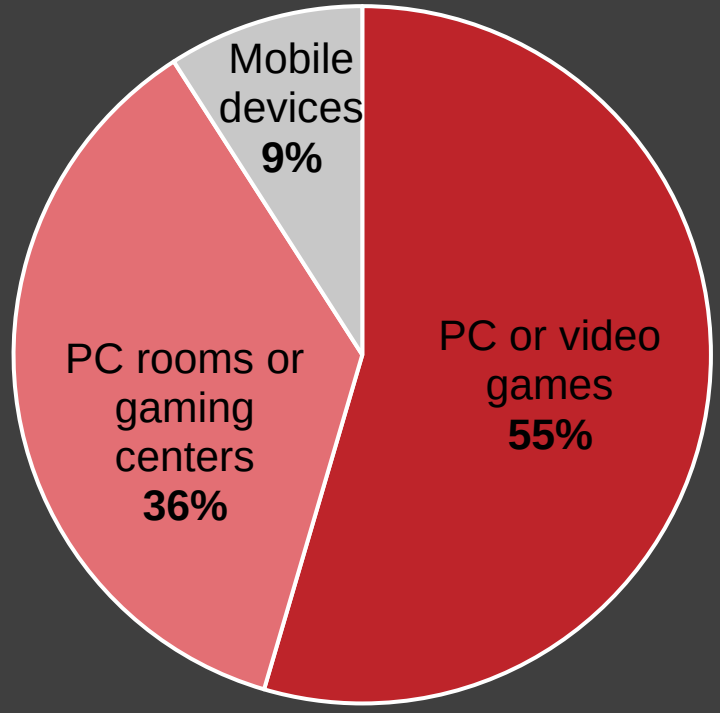
Overview of 13 studies

Age of sample



Type of gaming



Beach 2016, Bhatt 2017, Dehnert 2015, Dreher 2018, Rhee 2019, 2020, Swerniak 2020, Shin 2005, Wickaksono 2018, Yu 2016, Zhang 2019, Iannace 2020, Mirbod 1992, Plake 1983

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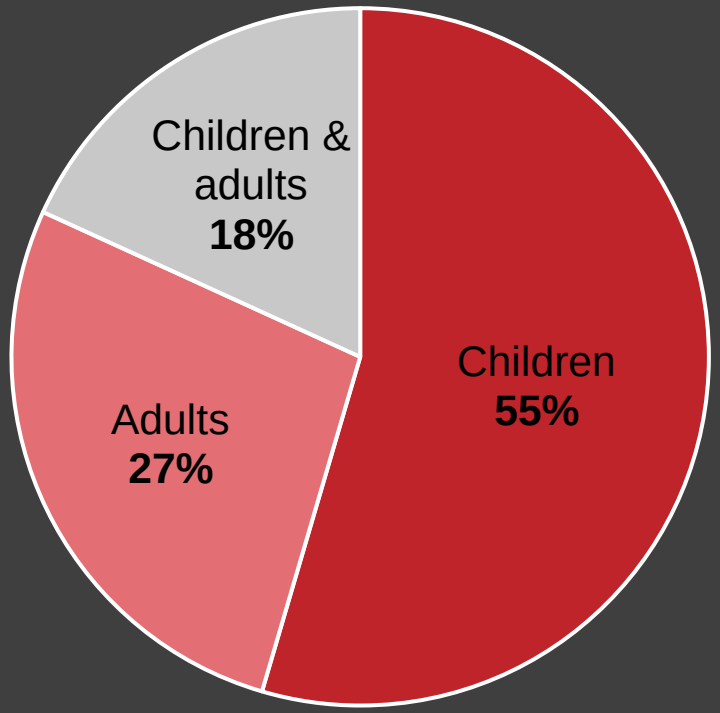

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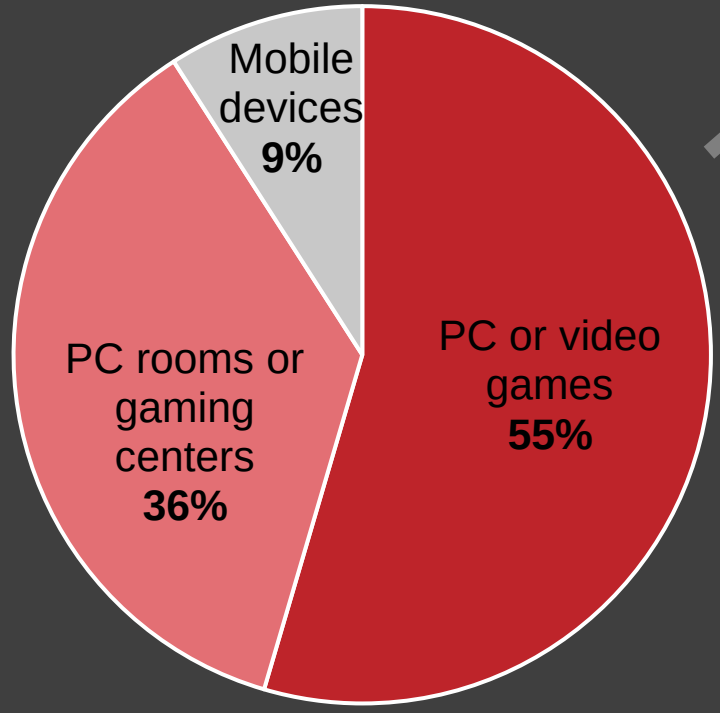

No studies on esports!

Beach 2016, Bhatt 2017, Dehnert 2015, Dreher 2018, Rhee 2019, 2020, Swerniak 2020, Shin 2005, Wickaksono 2018, Yu 2016, Zhang 2019, Iannace 2020, Mirbod 1992, Plake 1983

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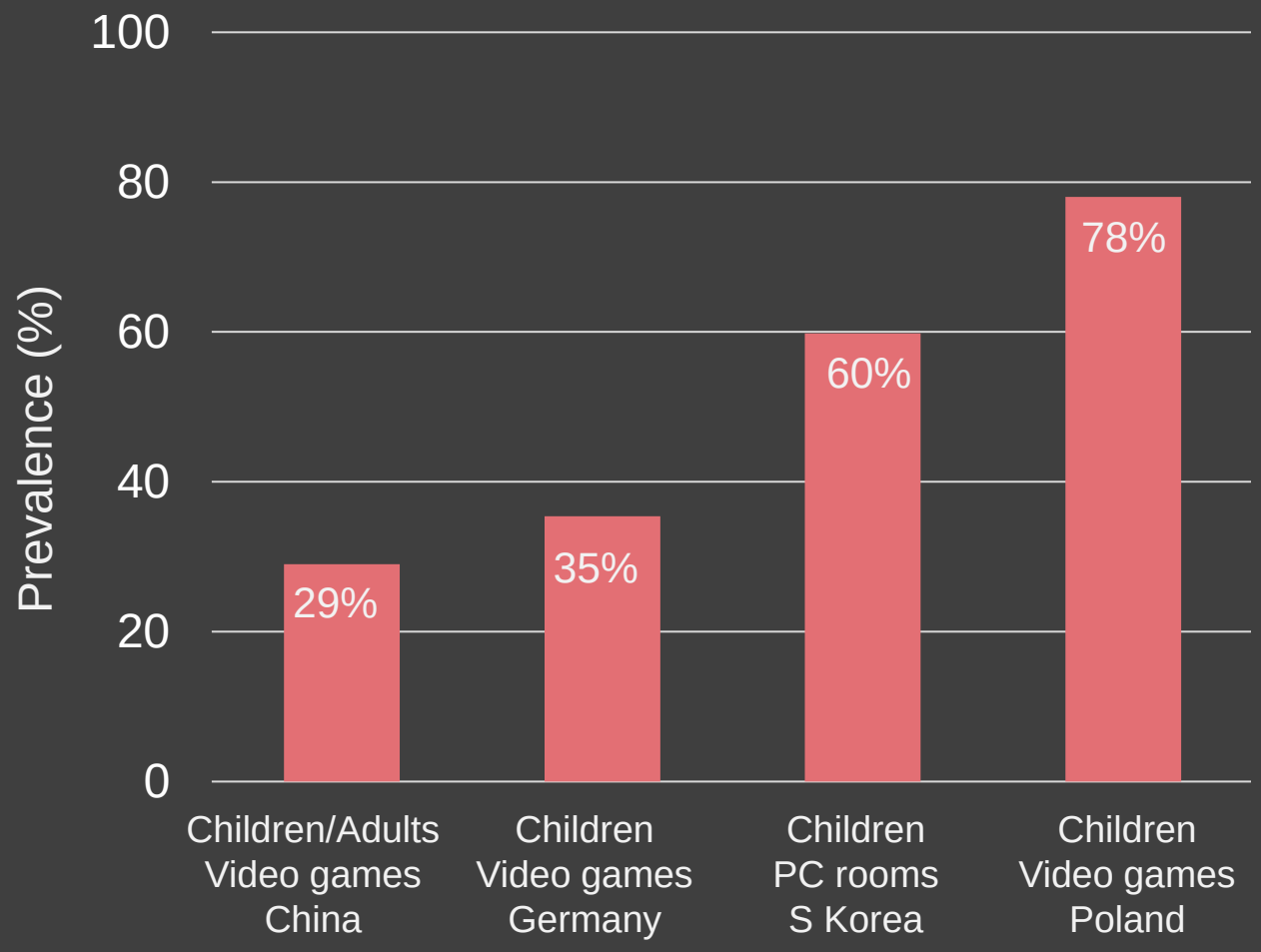
Prevalence of gaming



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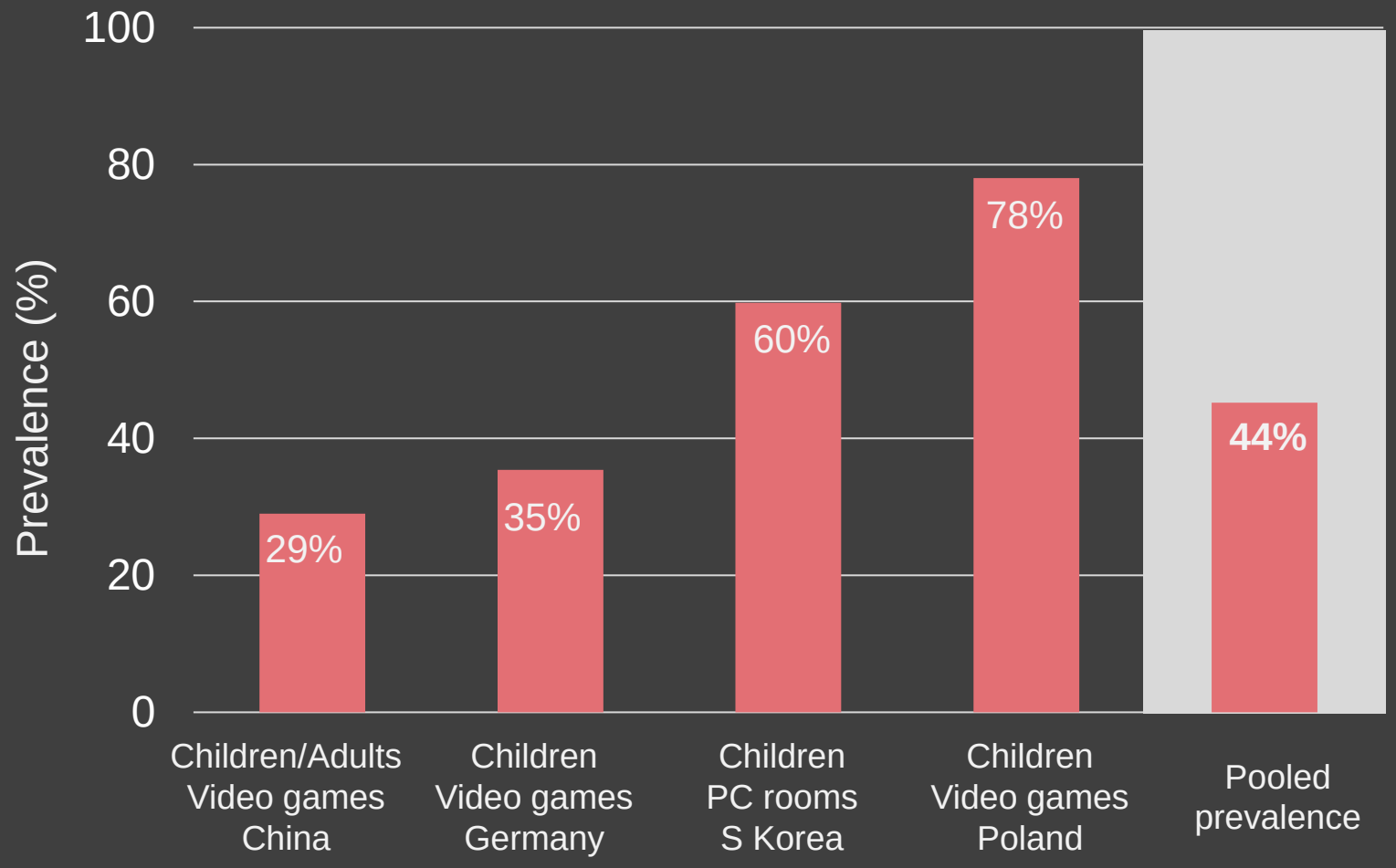
Prevalence of gaming



Dehnert 2015, Dreher 2018, Rhee 2019, 2020, Swerniak 2020, Zhang 2019

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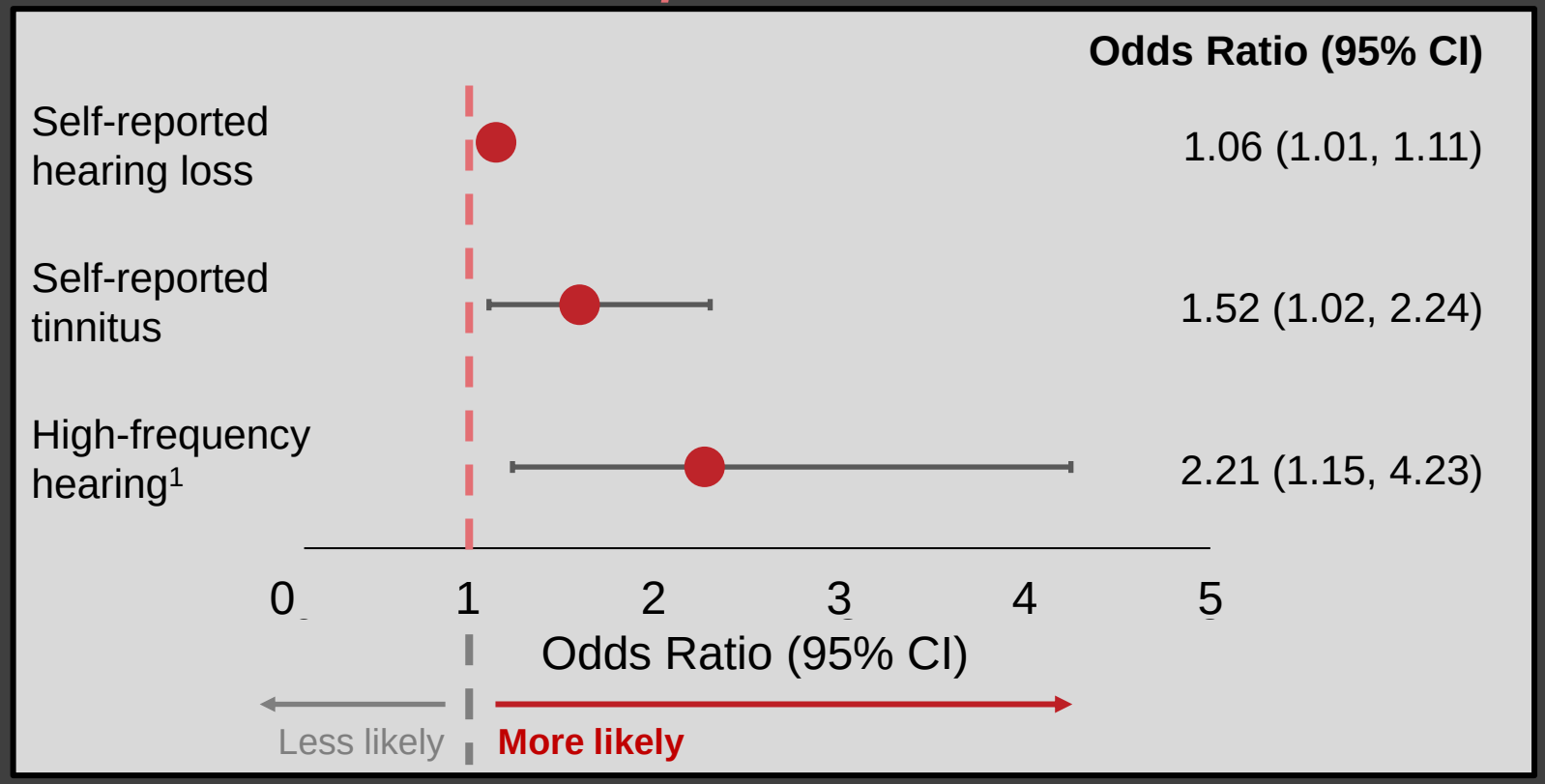
Associations of gaming with hearing and tinnitus

In samples of children…



[1]Audiometric hearing (3.0, 4.0, 6.0, 8.0 kHz ≥15 dB, both ears)
95% CI: 95% Confidence Interval

Beach 2016, Rhee 2019, 2020

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Associations of gaming with hearing and tinnitus

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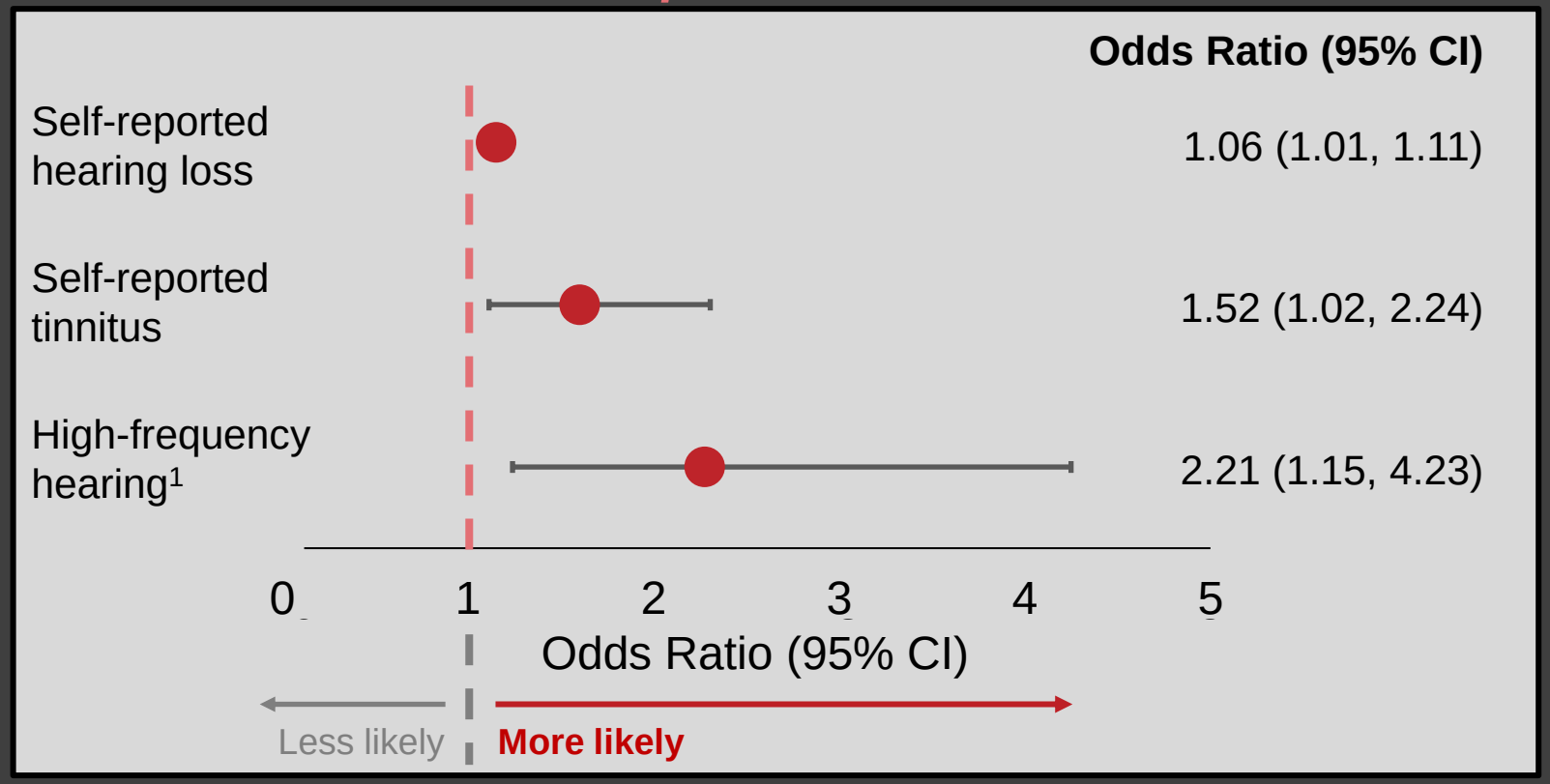

[1]Audiometric hearing (3.0, 4.0, 6.0, 8.0 kHz ≥15 dB, both ears)
95% CI: 95% Confidence Interval

Rhee 2019, 2020, Wicaksono 2018, Zhang 2019; Dehnert 2015, Dreher 2018, Wicaksono 2020, Shin 2005, Yu 2016

In samples of children…

Other key results

- More time gaming associated with higher odds of hearing loss.
- Boys (vs girls) played at louder volumes and for more time.

Duration:
Average 3-4 hours/week

Loudness:
Average ~85 to 90 dB

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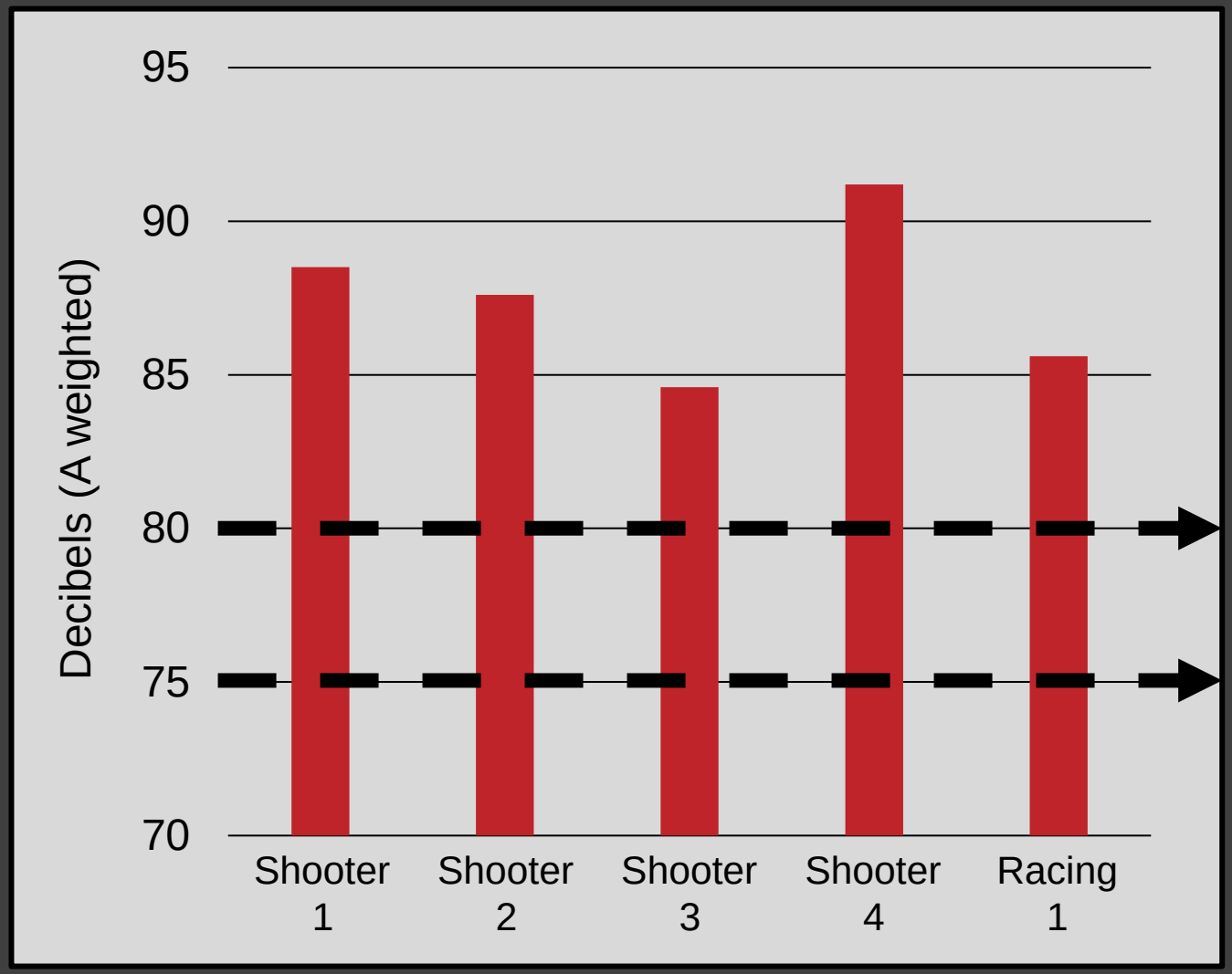
Average sound exposure levels from video games



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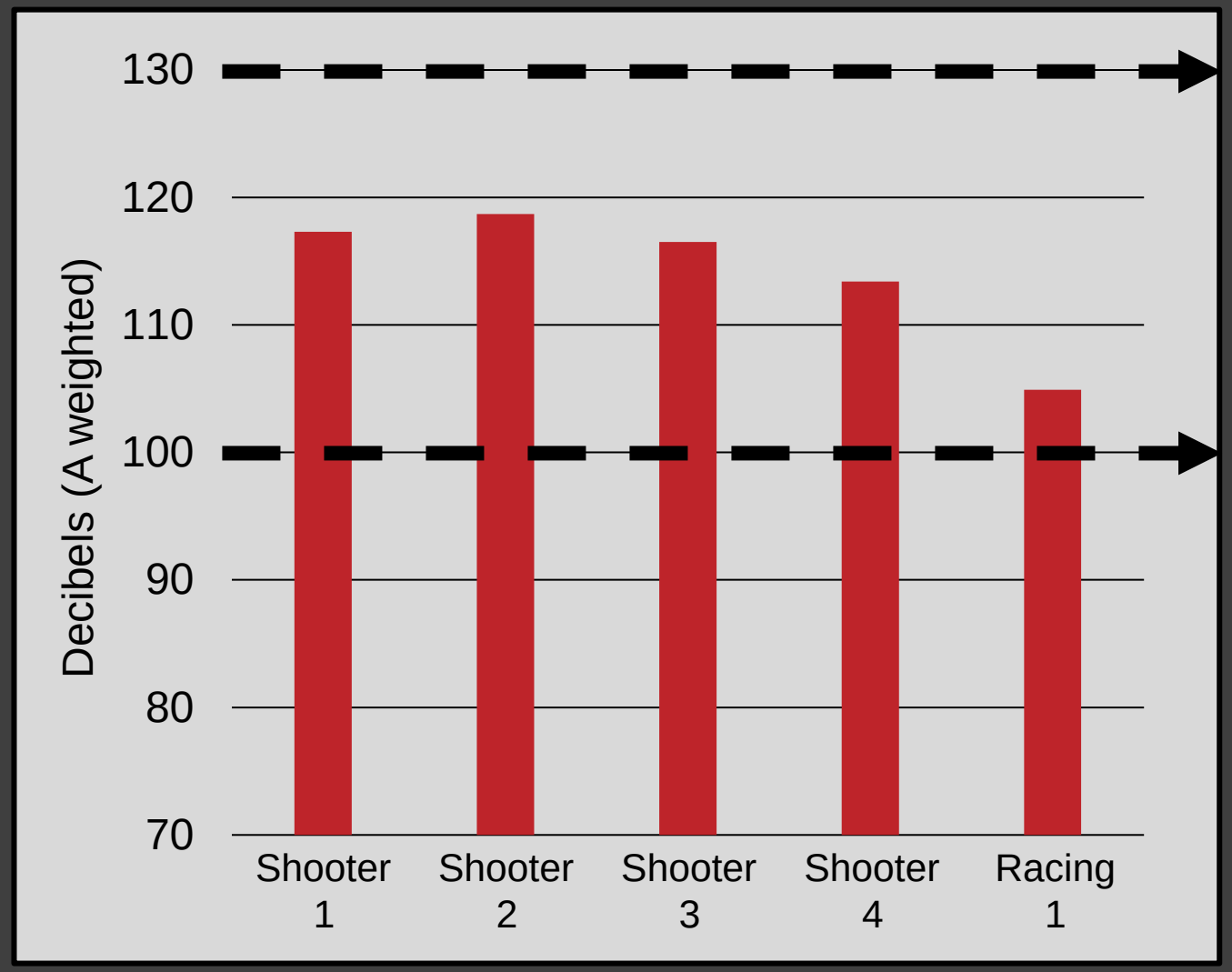
Peak sound exposure levels from video games



Permissible levels, *adults*

Permissible levels, *children*

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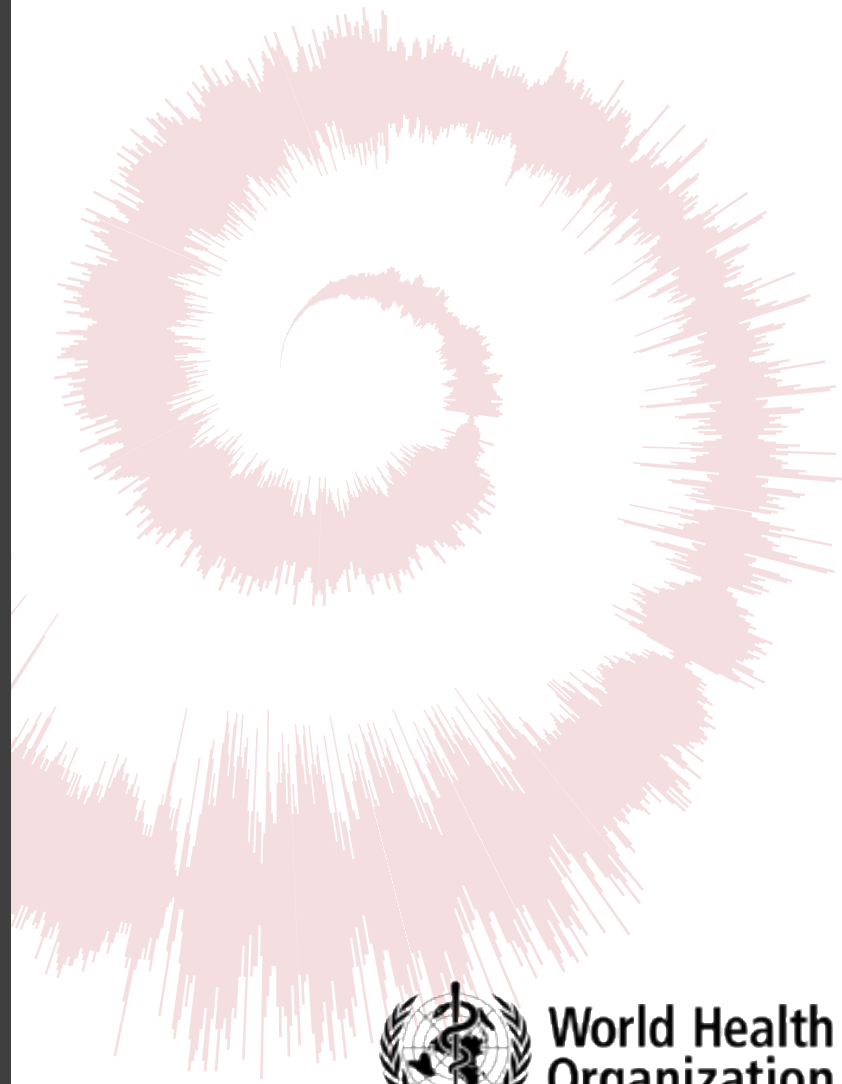
Permissible number of time listening (hours per week)

Based on estimates from the literature…

	Adults	Children
up to 85 dB Less conservative estimate	13	< 4

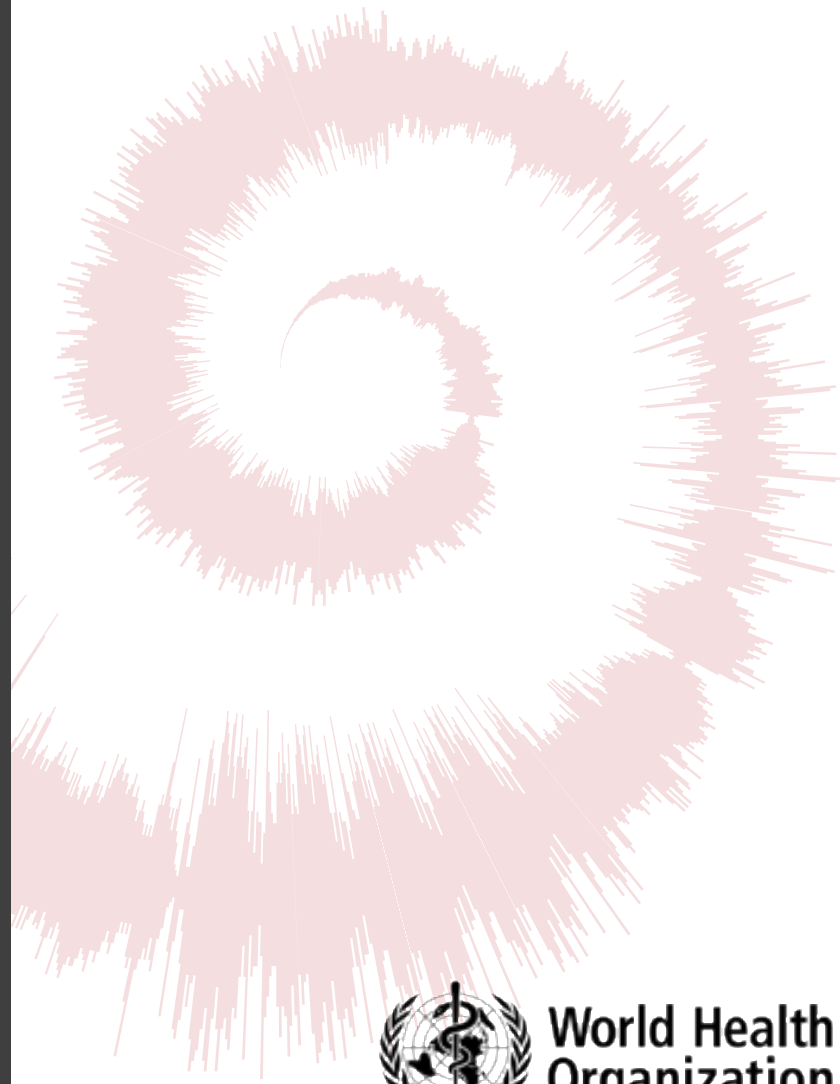


World Health Organization

Permissible number of time listening (hours per week)

Based on estimates from the literature…

	Adults	Children
up to 85 dB Less conservative estimate	13	< 4
up to 90 dB More conservative estimate	< 4	1.25



World Health Organization

Permissible number of time listening (hours per week)

Based on estimates from the literature…

	Adults	Children
up to 85 dB Less conservative estimate	13	< 4
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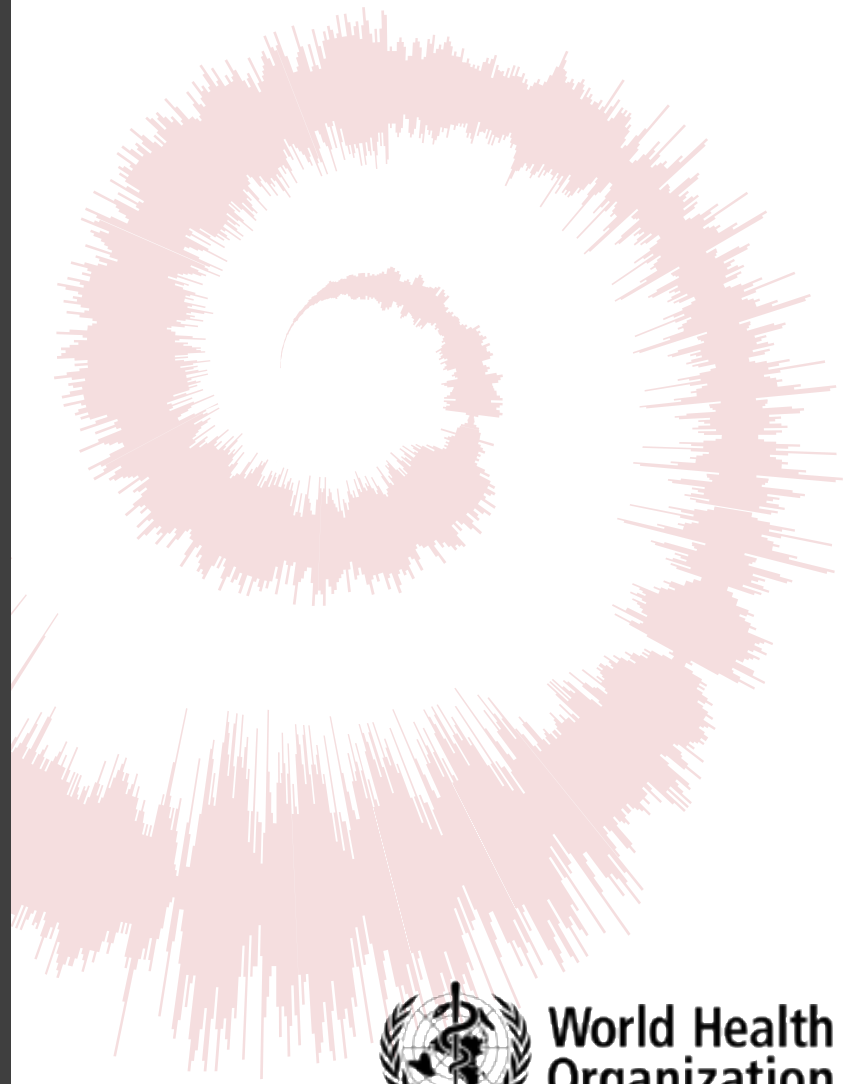
Across studies, children played an ***average*** of 3-4 hours/week

World Health Organization

Challenges and Conclusions

Challenges

- Relatively few studies
- Different methods, definitions
- Lack of data on esports



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Challenges and Conclusions

Challenges

- Relatively few studies
- Different methods, definitions
- Lack of data on esports

Highlights the need for standard research methodology, and opportunities to study sound exposure among esports players

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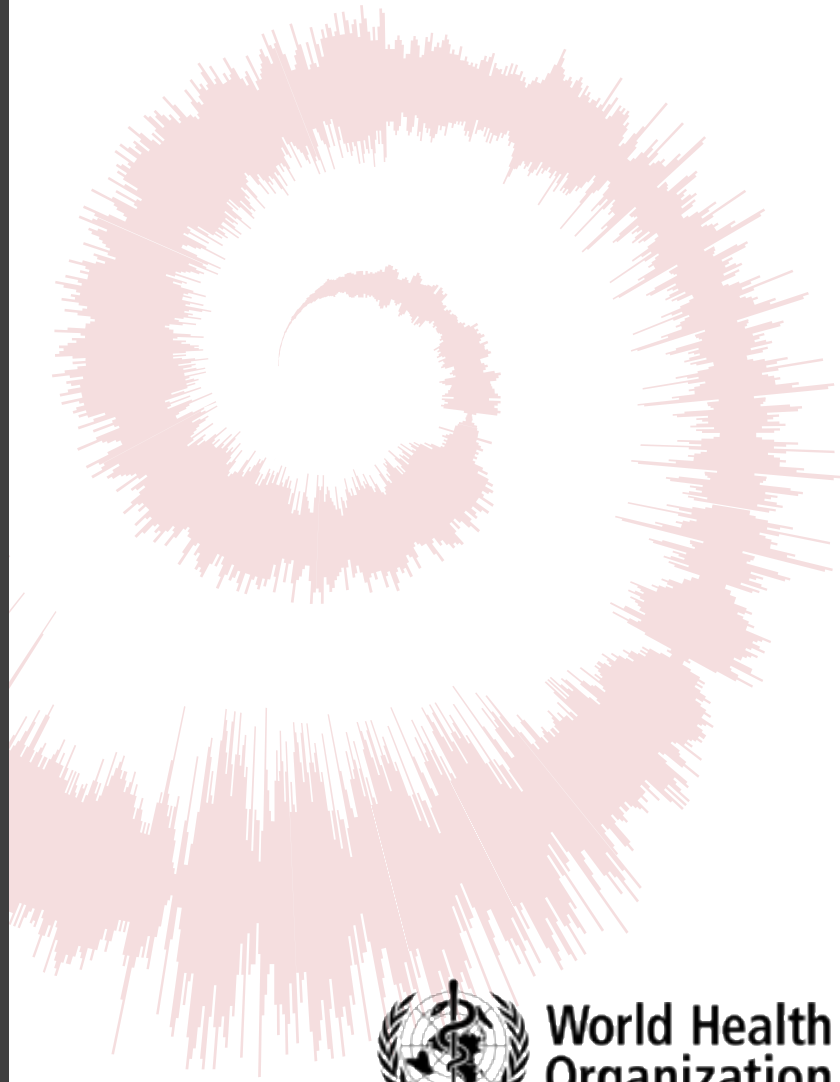
Challenges and Conclusions

Challenges

- Relatively few studies
- Different methods, definitions
- Lack of data on esports

Conclusions

- Consistent association between gaming and hearing loss and/or tinnitus
- Sound exposure often exceeds (or nearly exceeds) permissible levels



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Challenges and Conclusions

Challenges

- Relatively few studies
- Different methods, definitions
- Lack of data on esports

Conclusions

- Consistent association between gaming and hearing loss and/or tinnitus
- Sound exposure often exceeds (or nearly exceeds) permissible levels

Highlights the need to prioritize hearing loss prevention through safe listening among gamers

World Health Organization

Thank you!

dillalau@musc.edu

Published evidence is limited yet ***suggests that gaming is a common source of unsafe listening, particularly among young people.***

Citation: Dillard LK, Mulas PM, Der CM, Fu X, Chadha S. Risk of noise-induced hearing loss from exposure to video gaming or esports: A systematic scoping review. *BMJ Public Health* (under review)

World Health Organization

World Health Organization 75 HEALTH FOR ALL

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Gaming, esports and hearing: what do gamers and esports athletes say?

Gaming, esports, and hearing
What do gamers and esports athletes say?

Nicola Diviani & Sara Rubinelli
Center for Rehabilitation in Global Health Systems

UNIVERSITY OF LUCERNE

Swiss Paraplegic Research

Background

Videogames and esports are gaining increasing popularity worldwide.

There are health risks associated with gaming and esports, including hearing-related disorders due to prolonged exposure to loud sounds.

There is a lack of research on hearing loss among gamers and esports players, especially regarding listening behaviors and attitudes.

Aim of the study

Within the overall objective of identifying effective ways to inform interventions to promote safe listening in this group and to support the WHO Safe Listening initiative in the development of global standards dedicated to regulating sound exposure in the context of gaming and esports…

…to assess the association of listening behaviors among video gamers and esports viewers and players and their awareness and beliefs about the risks of loud sound exposure.

Methodological approach

- Online survey from September 2022 to January 2023.
- Shared on WHO's social media platforms and distributed to key stakeholders in the fields of ear and hearing health, as well as gaming and esports worldwide.
- Inclusion criteria:
  - aged 16+
  - good command of English, Spanish, French, or Chinese,
  - either video game players or involved in esports (as players or viewers).

Questionnaire

Questionnaire based on the Health Belief Model (HBM), the Transtheoretical Model of Change (TMC), and previous research on music- and noise-induced hearing loss.

Main findings: Socio-demographics

- Final sample: N = 488
- 67.7% males
- On average 28.4 years old
- Majority held a high school diploma/GED or a four-year college degree
- From 92 countries, but mostly from USA (14.3%, n = 70), UK (10.5%, n = 51), and India (8.2%, n = 40)

Main findings: Gaming habits

90.8% reported playing videogames.

Around one-third of gamers (35.7%, n = 158) reported playing for up to 6 hours per week, followed by a second group (33.2%, n = 147), who played between 6 and 15 hours per week, and a third group (31.1%, n = 138) who played more than 15 hours per week.

57.6% reported engaging in esports, with the majority (75%) only viewing.

Among *viewers*, the majority viewed on a monthly basis (29.5%, n = 79).

Among *players*, the majority took part in esports events on a weekly basis (37.1%, n = 23).

Main findings: Listening habits

Average volume setting 47.6% (SD = 21.3),

24.8% listens at a high (above 60%) or very high (above 80%) volume

Sounds are either extremely (37.5%) or very (34.1%) important when playing video games.

Viewers

- Average volume setting 45.6% (SD = 20.4)
- 18.3% listens at a high or very high volume

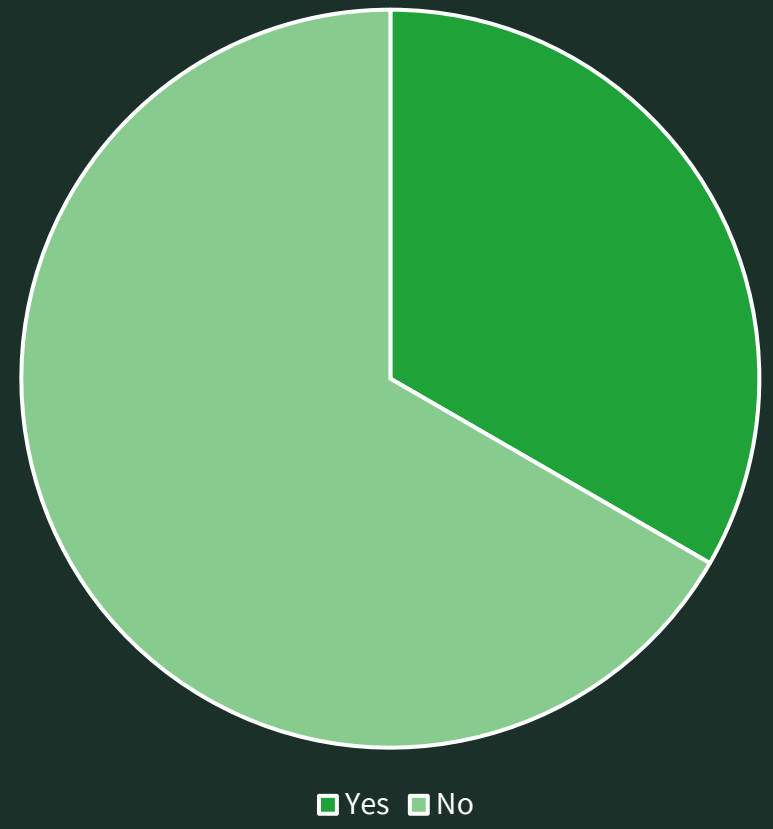
Players

- Average volume setting 55.7% (SD = 22.5)
- 21% listens at a high or very high volume

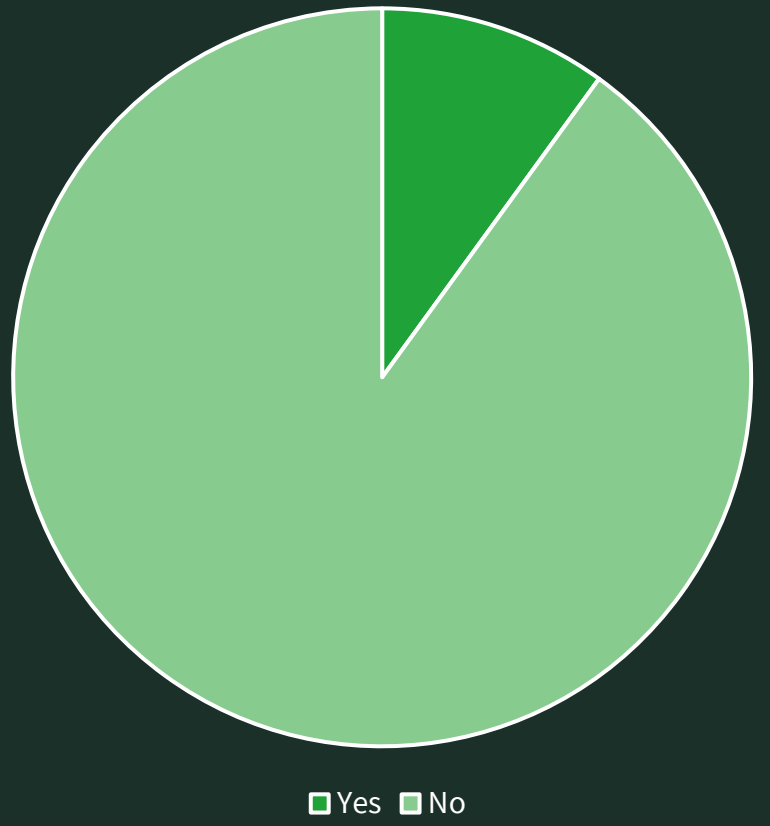
Sounds are either somewhat (29.2%), very (30.2%), or extremely (24.2%) important

Main findings: Protective behaviors

Takes a break from sound every hour



Checks usage



Main findings: Consequences

Almost half of the video games players reported having experienced at least once a ringing in their ears after playing (42.9%), and more than half have experienced fullness or fuzziness in their ears (53.5%).

Viewers

- Less than one-third reported having experienced a ringing in their ears (30.6%) or a feeling of fullness or fuzziness (30.2%)

Players

- Almost half (46.3%) experienced a ringing in their ears and 50.7% a feeling of fullness or fuzziness.

Main findings: Awareness and beliefs

- Good awareness of hearing loss risks associated with gaming and esports,
- High perceived severity of hearing loss, but relatively low perceived susceptibility to it.
- Perceived barriers to hearing loss prevention were identified, including a belief that reducing volume would limit gaming enjoyment,
- Overall, participants demonstrated high self-efficacy.

Main findings: Readiness to change

- We observed an even distribution across pre-contemplation, contemplation, and action stages.
- Pre-contemplation vs. contemplation
  - Those perceiving more susceptibility to hearing loss and recognizing greater benefits of preventive actions were more likely to be in the contemplation stage.
  - Those who perceived hearing loss as severe and had more self-efficacy were more likely to be in the pre-contemplation stage.
- Contemplation vs. action
  - Those with more self-efficacy were more likely to be in the action stage.
  - Those perceived greater barriers to preventive actions were less likely to be in the action stage

Main findings: Desire for information

- Half of the respondents expressed interest in learning more about hearing loss and safe listening in gaming and esports.
- Preferred information sources included device instruction manuals, dedicated websites, and integrated user interfaces in gaming devices.
- Trusted information sources are healthcare professionals and governmental or international agencies, with less reliance on traditional media and religious leaders.

Main findings: Group differences

- Gender
  - Male respondents spent more time on video gaming and placed greater importance on sounds.
- Age
  - Younger respondents spent more time on video gaming and placed greater importance on video game sounds. Also, they perceived themselves as less susceptible to hearing loss.
- Educational level
  - Participants with lower educational levels reported higher volume settings in esports.
  - Less educated respondents perceived fewer benefits of prevention and were less likely to be ready to change their listening behaviors. Those with higher education were more likely to be in the action stage of readiness to change.

Overall implications

- The findings can inform the development of guidelines or standards for safe listening in the context of video gaming and esports.

- These guidelines could include recommendations for appropriate volume settings and listening durations, as well as strategies for taking breaks and minimizing exposure to potentially harmful sounds.

Specific implications

- Need for targeted education and intervention programs to promote safe listening habits among video gamers and esports viewers and players.
- Focus on increasing awareness of the risks associated with loud sound exposure and providing practical strategies for reducing exposure to potentially harmful sound levels.
- Healthcare professionals and governmental or international agencies should be utilized as trusted sources of information on this topic.
- The gaming and esports industries are urged to play a role in promoting safe listening habits by incorporating sound dosage information and warnings into their products.

Thank you!

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Gaming, esports and hearing: what do stakeholders say?

What do gaming and esports stakeholders say?

Peter Mulas | MLS Consultation 2023

Purpose of stakeholder interviews?

Aim of stakeholder interviews

To gain insight and perspectives from experts on:

- Attitudes towards safe listening in gaming and esports
- Existing safe listening features and regulations
- Guidance for future implementation of safe listening features

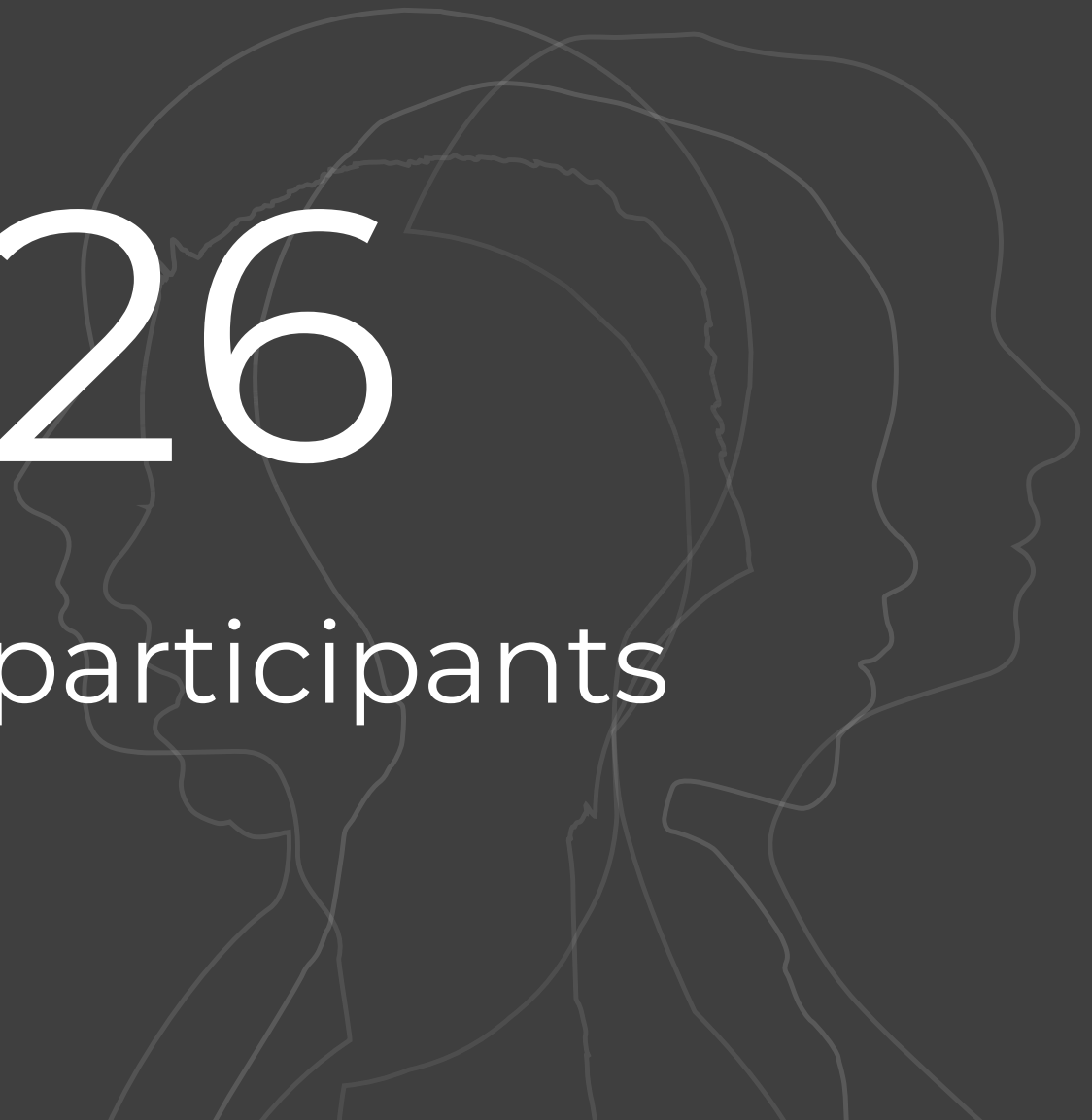
Participants

19

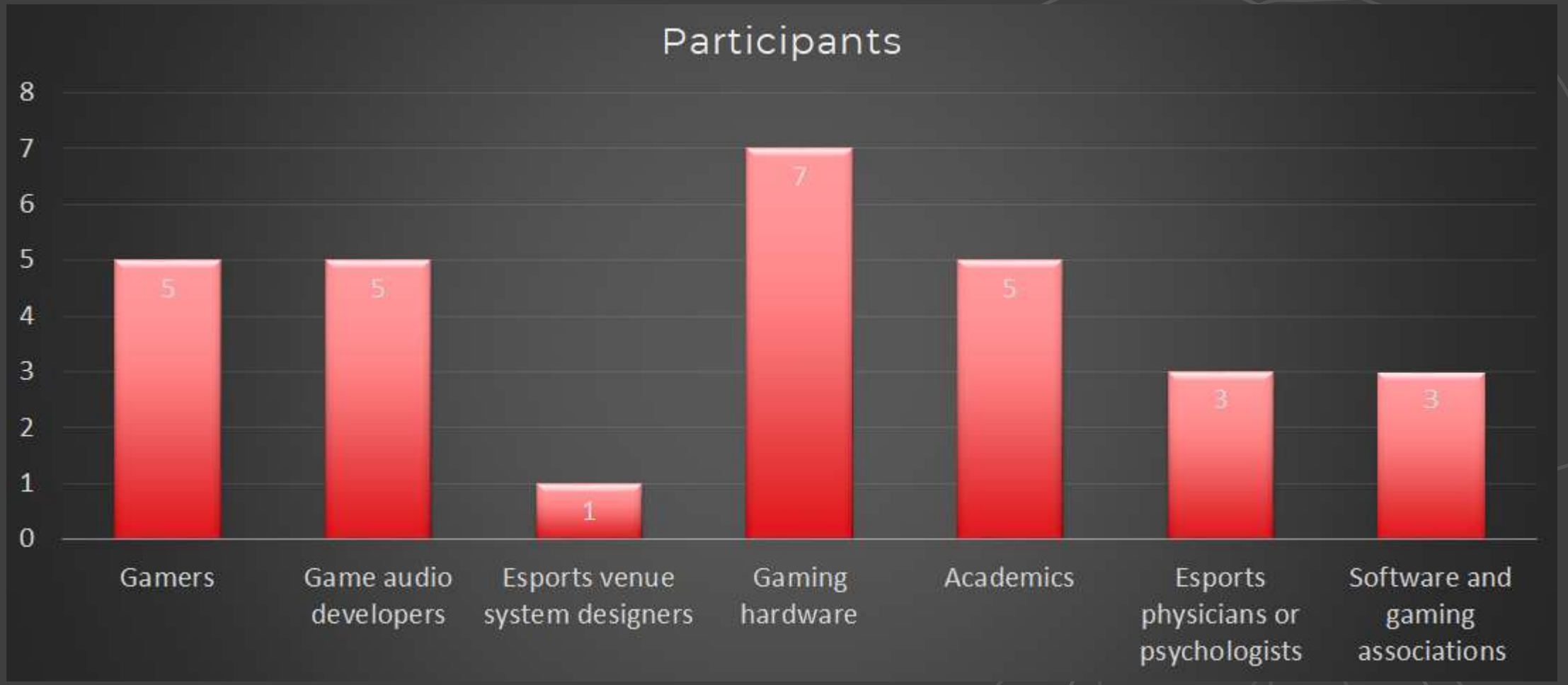
interviews

26

participants



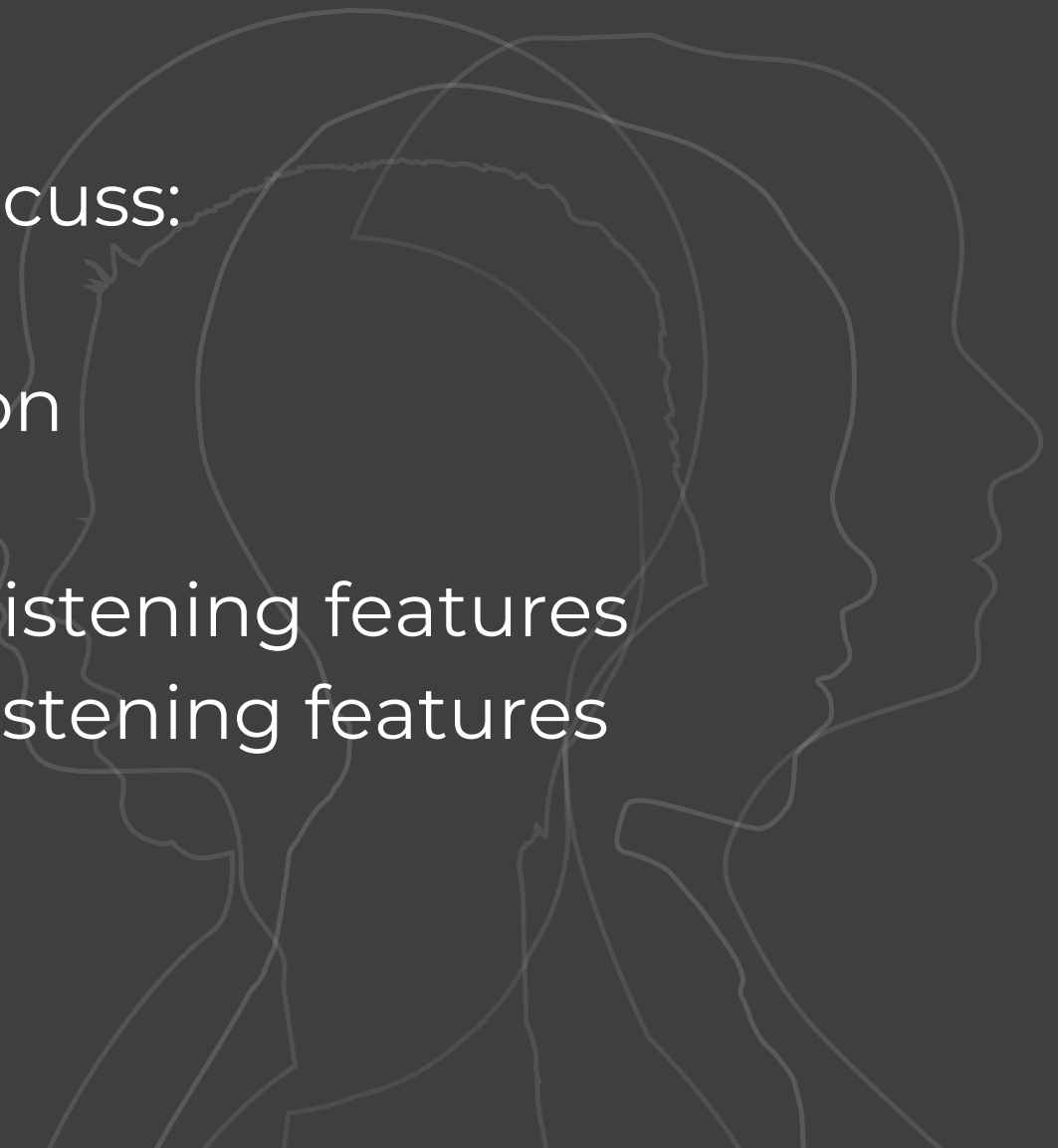
Expertise coverage



Interview questions

5 consistent questions used to discuss:

- Existing safe listening features
- Existing regulations or legislation
- Potential safe listening features
- Willingness to implement safe listening features
- Barriers to implementing safe listening features



Any addition to a game or system that is designed to reduce the risk of sound-induced hearing injury. Such a feature may do so by reducing the sound level and/or, reducing the duration of exposure; and/or reducing the frequency of exposure

What, if any, safe listening features currently exist in gaming devices and systems to protect the hearing of their users?

Direct and Indirect features

Direct safe listening features

- Text based warnings

Hearing Damage

- To prevent possible hearing damage, do not listen at high volume levels for long periods.

Example 1

Using headphones or earphones

If your computer has both a headphone connector and an audio-out connector, always use the headphone connector for headphones (also called a headset) or earphones.

CAUTION:
Excessive sound pressure from earphones and headphones can cause hearing loss. Adjustment of the equalizer to maximum increases the earphone and headphone output voltage and the sound pressure level. Therefore, to protect your hearing, adjust the equalizer to an appropriate level.

Excessive use of headphones or earphones for a long period of time at high volume can be dangerous if the output of the headphone or earphone connectors do not comply with specifications of EN 50332-2. The headphone output connector of your computer complies with EN 50332-2 Sub clause 7. This specification limits the computer's maximum wide band true RMS output voltage to 150 mV. To help protect against hearing loss, ensure that the headphones or earphones you use also comply with EN 50332-2 (Clause 7 limits) for a wide band characteristic voltage of 75 mV. Using headphones that do not comply with EN 50332-2 can be dangerous due to excessive sound pressure levels.

Example 2

Direct safe listening features

- Text based warnings

⚠ WARNING **System Alerts**

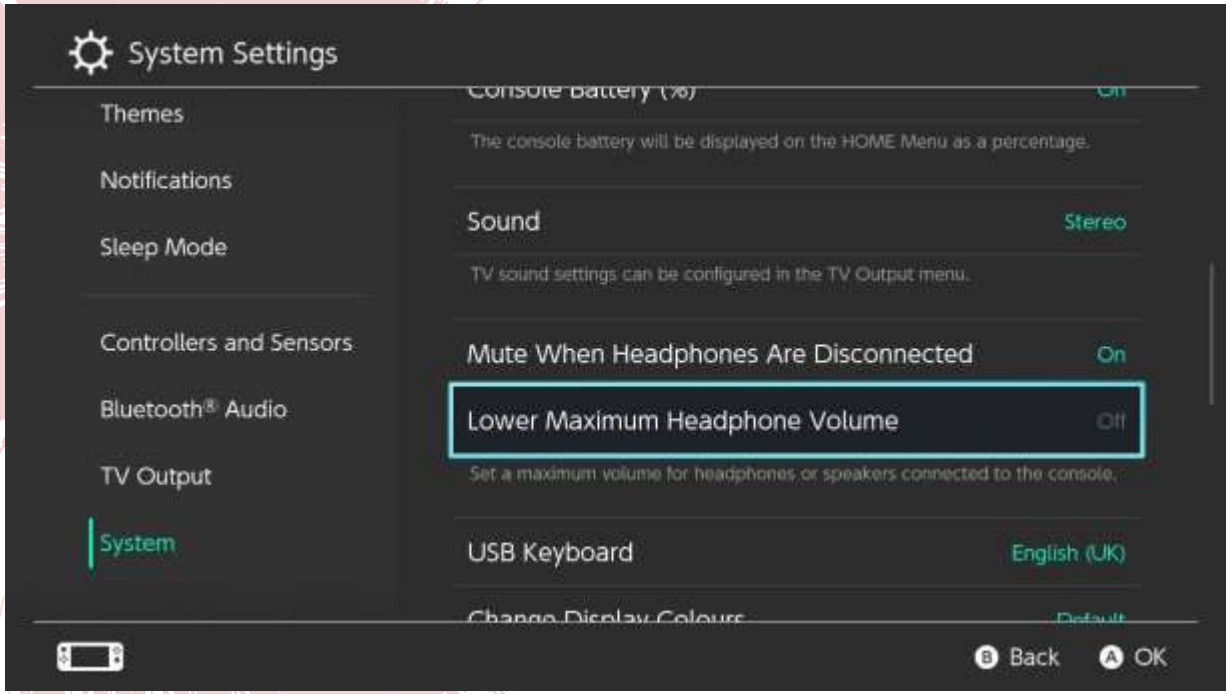
For your protection, you should take immediate action when prompted by system alerts. The headset may provide you with the following alerts:

- **Overheating Alert.** An audible and visual alert in the event the headset is overheating. If that alert appears/sounds, to reduce the risk of personal injury, immediately remove your headset and let it cool down before continuing use.
- **Sound Volume Alert.** A visual alert in the event of high volume levels. If that alert appears, lower the sound volume to reduce the risk of hearing loss.

Example 3

Direct safe listening features

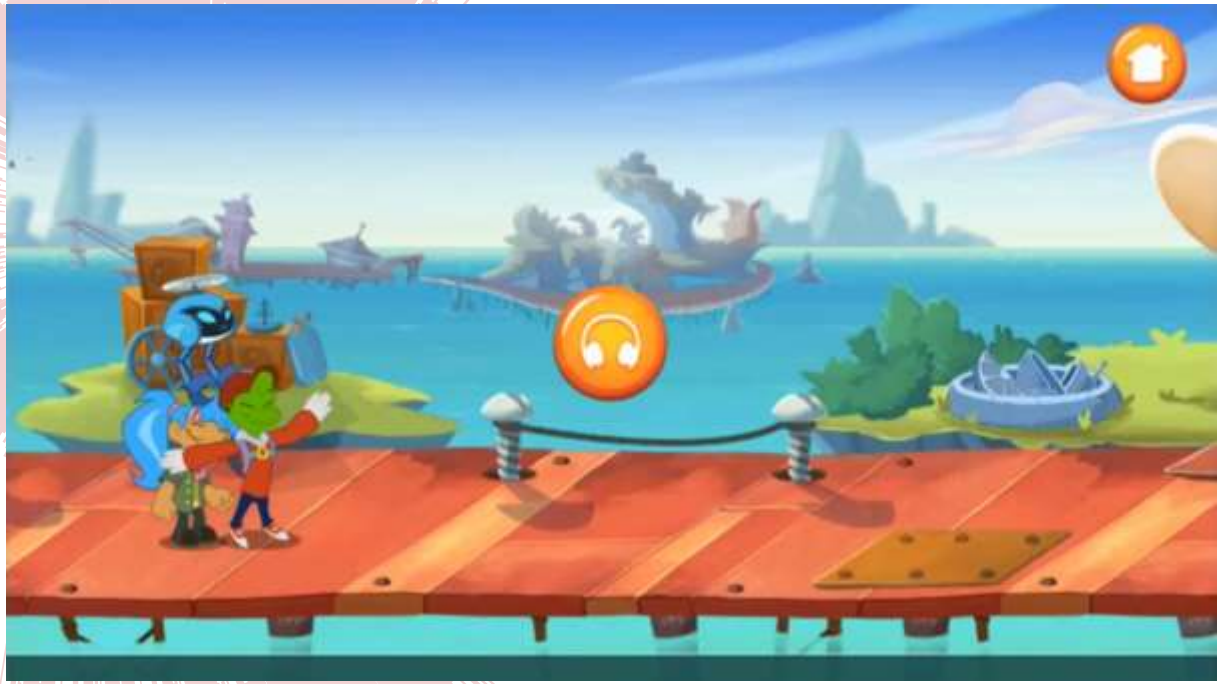
- Volume limiting systems



Example: Lower Maximum Headphone Volume setting

Direct safe listening features

- Volume limiting systems



Example: Headphone safety mode

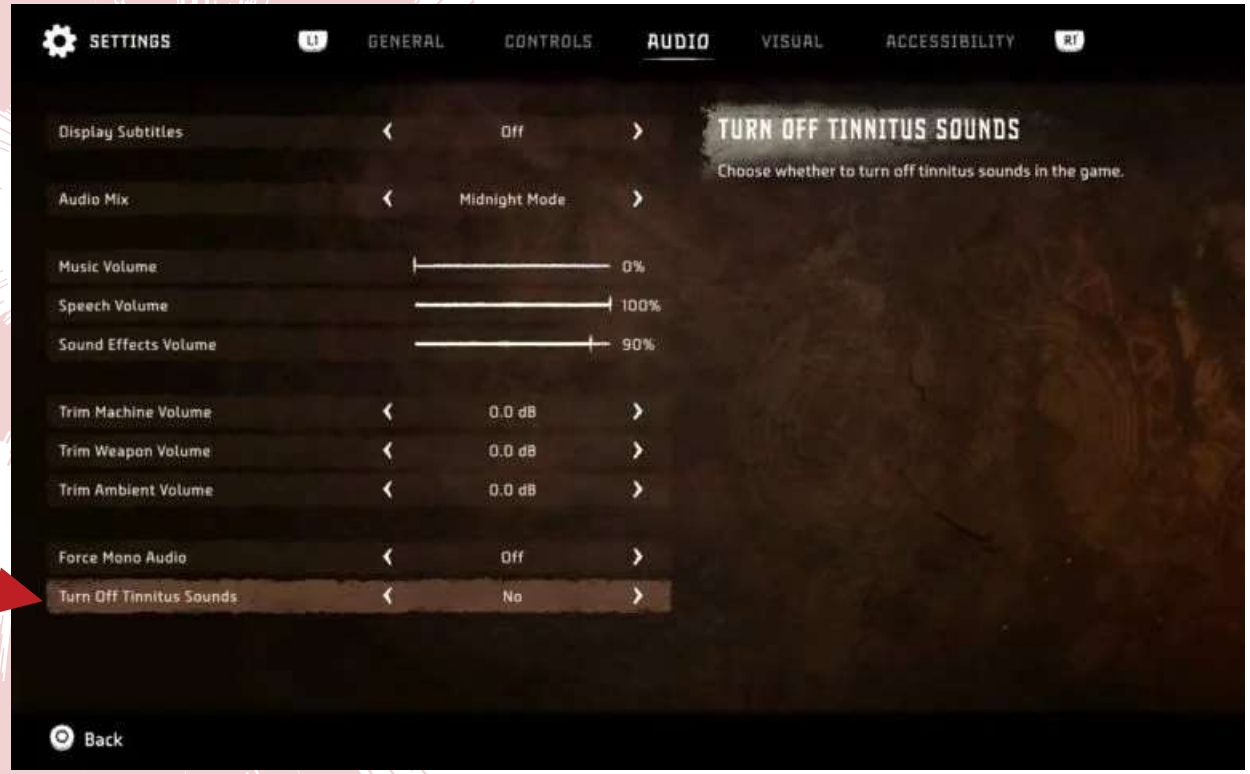
Direct safe listening features

- Volume limiting systems

Example: Headphone with volume limit

Direct safe listening features

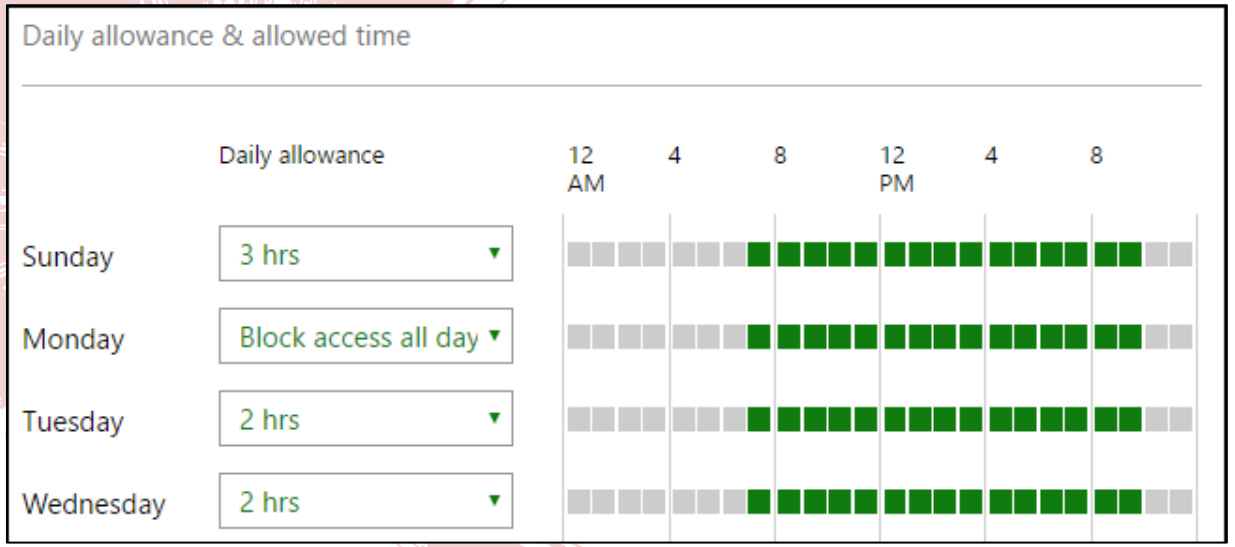
- Tinnitus



Example: Tinnitus sounds toggle

Indirect safe listening features

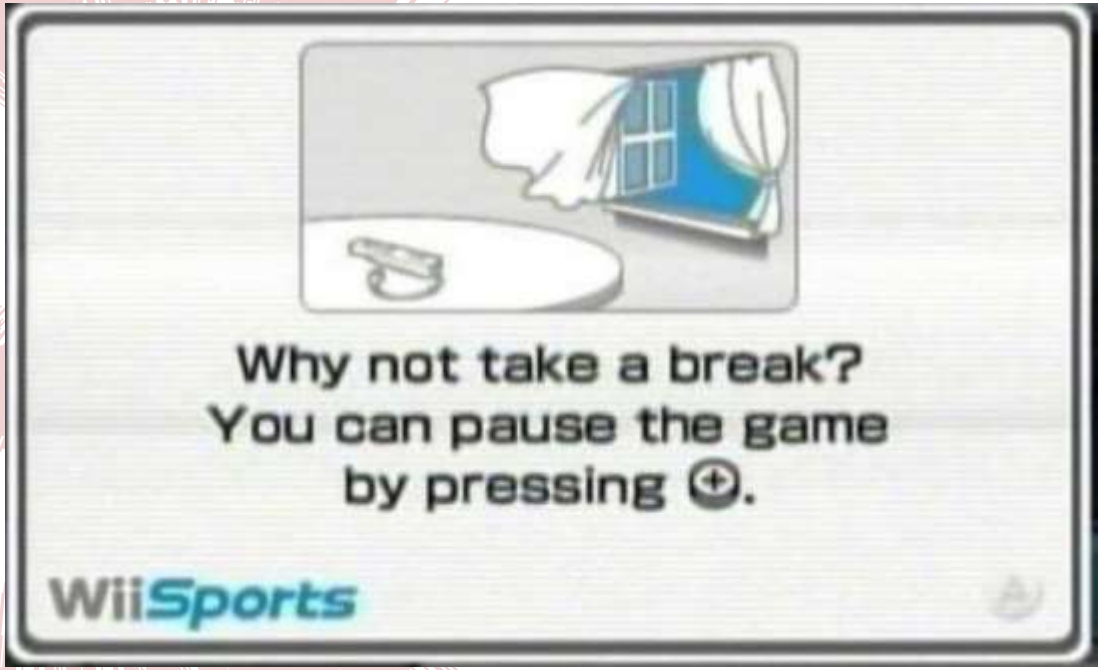
- Exposure limits



Example: Screen Time Limit

Indirect safe listening features

- Exposure limits



Example: Screen Time Limit

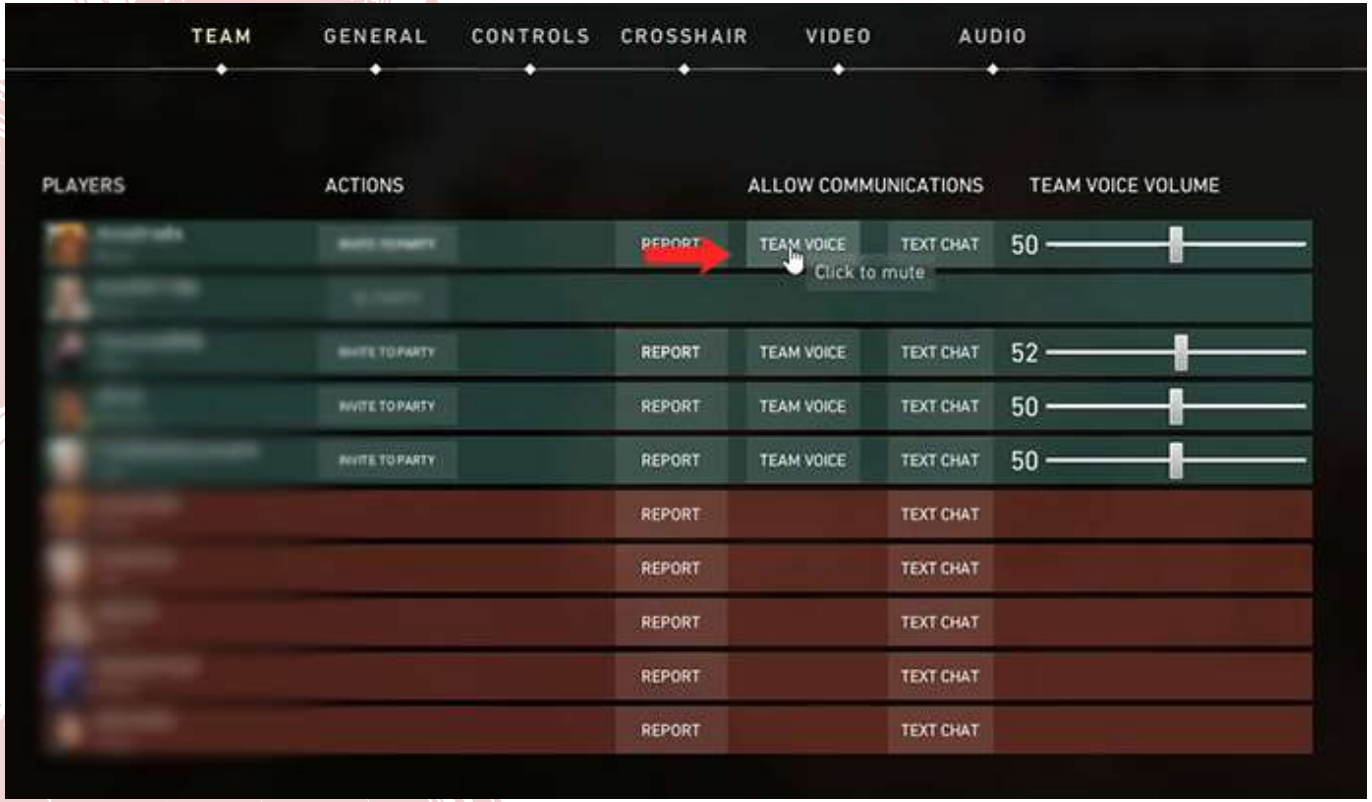
Indirect safe listening features

- Sound controls

Example: Sound control menu

Indirect safe listening features

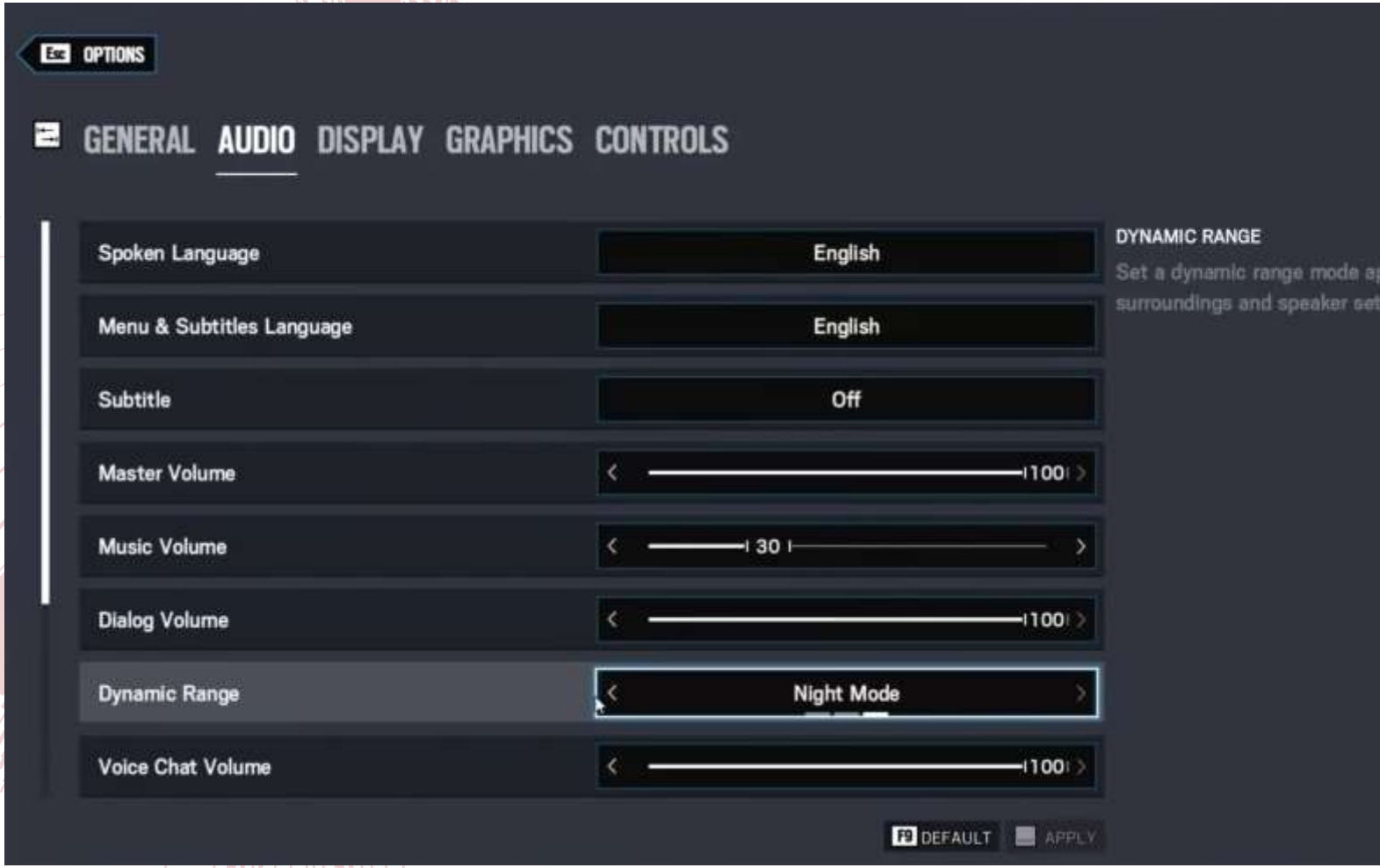
- Voice chat controls



Example: Voice chat controls

Indirect safe listening features

- Dynamic range controls



Example: Night mode

Indirect safe listening features

- Visual features

Example: Closed caption subtitles

Indirect safe listening features

- Visual features

Example: Visual Sound Effects enabled, portraying sounds as orange rings around the central

Indirect safe listening features

- Active and “passive” noise cancellation

Example: Passive cancellation via booth and headphones

Indirect safe listening features

- Tuned frequency response

Example: Gaming headsets can feature active and passive noise cancellation

What, if any, regulations, or legislations exist that ensure the safe listening of gamers and esports participants?

Safe listening regulations

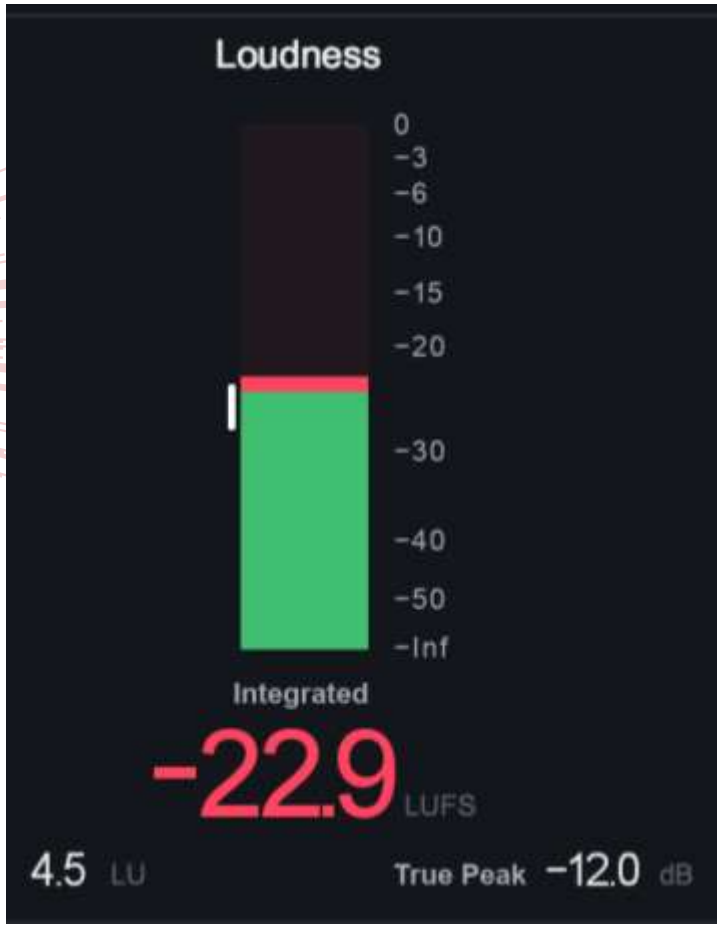
- Most participants reported a lack of awareness of regulations related to safe listening in gaming

Safe listening regulations

- European Union's Noise at Work directive (Directive 2003/10/EC) should gaming devices be used for 'work'
- European Telecommunication Standards Institute (ETSI)'s long duration disturbance limit of 118 dB (A-weighted)
- International Electrotechnical Commission (IEC) 62368-1:2018 standard for the safety of electrical and electronic equipment within the field of audio, video information and communication technology [only applicable to headphones]

Safe listening regulations

- Many game developers use voluntary loudness standards developed by Sony Audio Standards Working Group' (ASWG)
- Based on International ITU BS.1770-3
  - -24 Loudness units (LU) over 30 mins
  - -18 LU for handheld consoles
  - -1 dB True Peak level (TP)



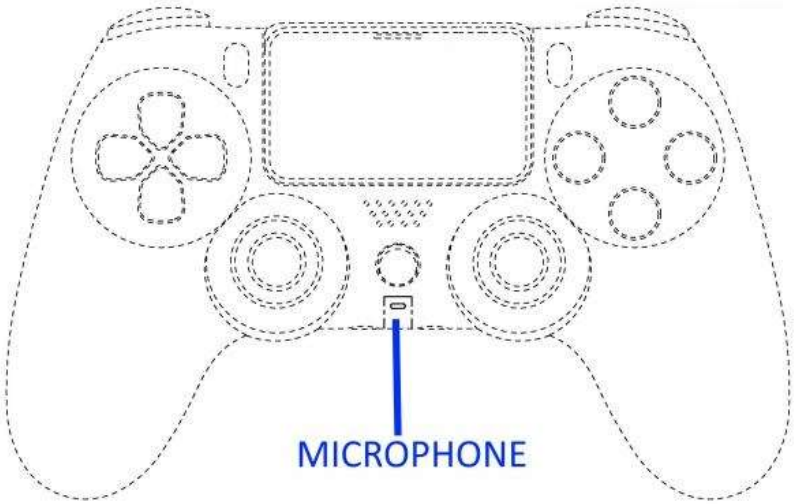
Safe listening regulations

- Local live sound regulations *should* apply for esports events
- Local occupational health and safety standards and/or labour laws *should* apply for employed esports professional athletes

What safe listening features could be implemented into video game products and esports events to promote safe listening features?

Potential safe listening features

- Game hardware or operating system level features preferred by most participants
- Easier to develop features at this “base” layer
  e.g. accessibility or screen time features
- Hardware could also feed information back into the game software



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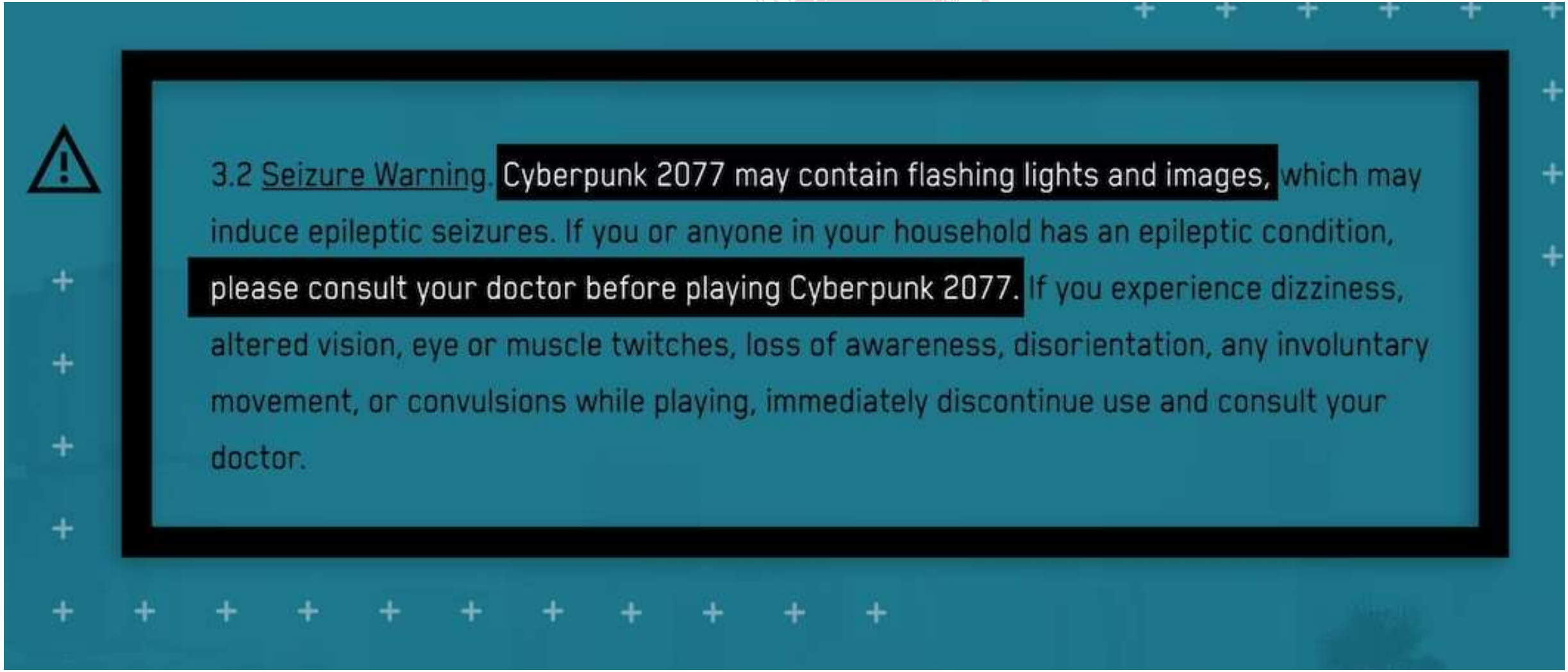
Potential safe listening features

- Some examples include:
  - Using on board microphones available from game accessories to monitor sound exposure
  - Use known SPL output levels from headphones to monitor sound dosage
  - Impose limits to sound pressure level outputs when dosage is exceeded
  - Use headphone detection system to lower volume levels globally

Potential safe listening features

- Game software features
  - In game presentations to warn of hearing damage
  - In game prompts to provide sound dosage information and or ask questions regarding auditory symptoms, e.g. “are your ears ringing?”

Potential safe listening features



Potential safe listening features

- Game software features
  - More independent control over the sound levels to remove unnecessary sounds.
  - Reduce sounds in between rounds.
  - Set dynamic range limits via setup process
  - Spend more time on mastering process to balance in game sounds

Potential safe listening features

- Educational features and safe listening promotion
  - In game promotion is important, but may not resonate with all gamers
  - Promotion of safe listening via game influencers and esports personalities
  - Educating physicians and hearing health care providers on esports and risks to hearing

Potential safe listening features

- Mandated acoustic conditions for large scale esports events
- Volume limits on headphones
- Acoustic solutions (such as booths)
- Adherence to local regulations for audience members

What is the readiness (awareness and willingness to act) of the gaming and esports industry to promote safe listening and implement related listening features into their products and events?

Willingness and readiness

- Optimistic responses:
  - Customer care is important for sustainability
  - Gaming industry has already implemented similar features (Screen time, accessibility)
  - No one wants to develop products that could harm the hearing of gamers

Willingness and readiness

- Pessimistic responses:
  - Depends on what safe listening looks like and costs the businesses involved
  - Gamers and developers may be unwilling to adopt features if the gaming experience is compromised
  - Resistance to implement if gaming industry feels like it is being singled out

What are possible limitations and/or barriers to the implementation of safe listening features in gaming and esports products and events?

Barriers and limitations

- Poor user experience

Barriers and limitations

- Poor user experience
- Technical implementation

Barriers and limitations

- Technical implementation
- Gamer indifference
- Development redundancy

Barriers and limitations

- Technical implementation
- Gamer indifference
- Development redundancy
- Competitive forces

Barriers and limitations

- Technical implementation
- Gamer indifference
- Development redundancy
- Competitive forces
- Financial / resource requirements

Next steps

Next steps

- Stakeholder perspectives will be included as part of an extended background study investigating safe listening in gaming and esports

- Interviews have demonstrated we need to treat gaming and esports differently

“a journey of a thousand miles begins with a single step”

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Questions

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Safe listening in gaming and esports: challenges and opportunities

GVGC
Global Video Game Coalition

https://www.askaboutgames.com/

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What can be done? Next steps and discussion

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Group work: Make listening safe: what comes next?

Group work

Make Listening Safe: What comes next?

8 June 2023

Questions

What more needs to be done?
Actions

Whom are we missing?
stakeholders

What more needs to be done?

	What more needs to be done?	Purpose	Who will we reach by doing that?	Steps

Who are we missing?

	Type of stakeholder	Name	Contact (if possible)

Group 1: Room U2

Facilitator: Arveen Sodhi

Nicola Diviani	Lauren Smith
Terez Lord	Cyndi van den Hanenberg
Brian Schmidt	Joseph Cerquone
Jessica Borowski	
Amarilis Melendez	
Michael Chowen	
Raju Desai	
Masahito Kawamori	
Mark Laureyns	
Brendan Morrissey	
David Prescott	
Jos Remy	
Roxana Widmer-Iliescu	
Richard Neitzel	
Jim Patsiantzis	

Group 2: Z1 - Z2

Facilitator: Peter Mulas

Sergi Mesonero
Melita Moore
Mike Somerset
Andreas Thulin
Patrik Žúdel
Kris Chesky
Rebecca Colbourne
Raphael Elmiger
Adam Hill
Ricky Kej
Jörn Nettingsmeier
Aderinola Olopade
Moses Serwadda
Richard Glover
Yao Jing

Kuba Mazur
Colleen Le Prell
Sara Rubinelli
Marion Marincat

Group 3: Room W2

Facilitator: Lauren Dillard

Tatjana Sachse	Stephen Wheatley
Keita Suyama	Katya Feder
Karissa Chesky	Adriana Lacerda
Ian Bryan Hoffman	Kelly Tremblay
Jos Mulder	
Nick Peverett	
Michael Santucci	
Rob Shepheard	
Meghan Taylor	
Karl Brookes	
Simao de Campos Neto	
Chuck Kardous	
Bohan Leng	
Ian O'Brien	

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Feedback from working groups

Group 1

Make Listening Safe: What comes next?

8 June 2023

What more needs to be done?

	What more needs to be done?	Purpose	Who will we reach by doing that?	Steps
	Approach celebrities/- Kevin hart, u2, larry mullen slash, robert plent(led zeppelin) Alisha silverstone, katie holmes, danny devitto, jimy kimmel,		General public	Brendan (One pager, describing their experience/message...)
	Creative website/ pioneer/teaching dj to children			Brendan
	More engagement with marketing professionals, behavioral scientists (pro bono help from ad council in the US, Canada, etc.)			Joseph
	Make WHF youtube channel'			WHF
	Approach lifestyle (e.g., tiktok) influencers (millie brown, danny gonzales preston playz...		Young	Terez/ Lauren Smith

Who are we missing?

	Type of stakeholder	Name	Contact (if possible)
	marketing professionals,		Joseph
	Specialist in occupational health promotion		Joseph, cyndi
	Pro-players in gaming		dimitris
	Spotify, Protunes, live-nation, AEG	Claudias boller, bobby o'reilley, john reed, gary gersh	Brendan
	Game-developers/ organizers	Blizzard, Riot, Epic, microsoft	brian

Group 2

Make Listening Safe: What comes next?

8 June 2023

What more needs to be done?

What more needs to be done?	Purpose	Who will we reach by doing that?	Steps
Work with Audiology societies (BAA, BSA) and others internationally (AAA, ASHA, EFAS)	Awareness, education, new partners in pushing content	1) Audiologists, 2) at risk populations they serve	Liasions with organizations
Module based training	Adopting into current curriculum - electronic	Information technology Teachers	
Music education/hearing education within childhood education – BEST ACCESS – collaboration needed	Prepare teachers to deliver content	1) Teachers, 2) children	Engage music education community
Books for children – leverage some existing resources – Dangerous Decibels?	education/awareness	children	
Identify populations that may have greater risk – autism, neurodiversity, sound tolerance – safe for who? Misophonia, hyperacusis, multiple sclerosis	Inclusiveness of guidance	At-risk listeners	Events, conferences, tourism conversation
Parent education	Parents supervise kids listening	1) Parents, 2) kids they support	
Contact military musicians and instrument	Education of the	At risk musicians	Kris, Ricky

Who are we missing?

	Type of stakeholder	Name	Contact (if possible)
	Professional caregiver societies	BAA, BAS, EFAS, AAA	Becky – contact for UK societies Colleen – contact for US societies ASHA
	Educators (K-12); tertiary level	Music educators	Kris Chesky – handbook may be helpful
	At-risk individuals Amateur musicians	Amateur Musicians – practice in basements, carnivals/marching band practice – access mailing lists? Social media sites?	Jorn/Patrick
	Music journalists	Authors who can write critical thinking pieces that shape musician opinions, knowledge, and behavior; youtubers Andrew Huang	Would require local help everywhere – Jorn (in Germany) Patrick
	Professional gamers	Very famous gamers with large following and CEO of large company	Patrick – help with short intro/content for outreach; Melita
	Audio Engineering Society	Leadership needs to be involved in addition to Adam and Michael as members	Adam HIll, Michael Santucci
	People with lived experience with HL		

Group 3

Make Listening Safe: What comes next?

8 June 2023

	What more needs to be done?	Purpose	Who will we reach by doing that?	Steps
	Routine social media communication	Reach more people with our messaging on a consistent, repetitive basis	Target audience	Creating a single virtual name ("@makelisteningsafeintiative") that is the same across all platforms -> Website, Instagram, Twitter, Facebook, Youtube, Podcasts. Have it linked on CDC and WHO resources. Journalism students/social media managers will post on a routine.
	Cultural competency	Increase inclusion and diversity efforts to ensure that understanding for the message is better suited more groups of people.	More people that will be educated about our hearing health mission internationally	Find partners in different countries to improve messaging that is better targeted to their cultures (venue owners, community partners, trade associations)
	Increased educational standards	Create clear guidelines for what educators can say to youth that is consistent and accurate for repeated messaging (e.g brushing your teeth every day, wearing sunscreen, etc.)	Educators and youth	Contact educational ministers/leaders, create concreate educational toolkits that can be disseminated to teachers, music teachers, etc.
	Inclusion of youth	Need for more youth input as to what will actually be useful in informing the WHO what kind of messaging is most effective to youth	More youth	Create a Make Listening Safe YOUTH AMBASSADOR Group: Designate someone from the team to take charge of organizing said group, create an application to join the group, review applicants, utilize group members to contribute ideas/spread centralized information (see first action item)

Who are we missing?

	Type of stakeholder	Name	Contact (if possible)
	Journalism students to run #makelisteningsafe campaign on social media pages for free (mutualistic relationship)	Professor of Journalism in the UK	Will be contacted
	Social media managers	Steven	
	Videographers	Katya	
	Educators	Meghan	
	Organizer of youth group	Karissa	
	Podcasters	Michael	

World Health Organization 75 HEALTH FOR ALL

ITU

Introduction to Day 3 thematic working groups

Thematic group D

Chair: Adrian Fuente

Start time: 9:00 am

Room: W1

Research protocol

Adrian Fuente
Katya Feder
Adriana Lacerda
Colleen Le Prell
Richard Neitzel
Lauren Smith
Kelly Tremblay

Thematic group C

WHO-ITU Global standard for safe listening devices and systems

Chair: Masahito Kawamori

Start time: 9:30 am
Room: Z1-Z2

Denis Andreev
Karl Brookes
Michael Chowen
Simao de Campos Neto
Raju Desai
Fabio Digiacomo
Richard Glover
Yao Jing
Chucri (Chuck) Kardous
Masahito Kawamori
Mark Laureyns
Bohan Leng
Ian O'Brien
David Prescott
Jos Remy
Karthic Veera
Stephen Wheatley
Roxana Widmer-Iliescu

Thematic group B

Safe listening standard for venues & events: implementation

Chair: Kris Chesky

Start time: 10:30 am

Room: V

Jessica Borowski
Kris Chesky
Karissa Chesky
Rebecca Colbourne
Terez Lord
Brendan Morrissey
Adam Hill
Ian Bryan Hoffman
Ricky Kej
Amarilis Melendez
Jos Mulder
Jörn Nettingsmeier
Aderinola Olopade
Nick Peverett
Michael Santucci
Moses Serwadda
Rob Shepheard
Meghan Taylor
Cyndi van den Hanenberg

Thematic group A

Gaming & esports

Chair: Shelly Chadha

Start time: 10:00 am
Room: U1

Nicola Diviani
Sara Rubinelli
Stephen Wheatley
Terez Lord
Sergi Mesonero
Melita Moore
Tatjana Sachse
Brian Schmidt
Patrik Žúdel
Andreas Thulin
Jim Patsiantzis
Kuba Mazur