



Long term usage and satisfaction of hearing aids

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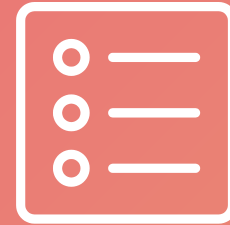
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Presentation Outline



1. Introduction



1. Introduction

- Hearing aid has been proven to be an effective rehabilitation device for hearing loss (Mulrow Cynthia, Tuley Michael, & Aguilar, 1992).
- However, the usage rate in Singapore is low with only a reported 3.3% usage rate in 2010 (National Health Survey, 2010).
- Only 35.7% of the subjects with hearing loss used their hearing aids for >7 hrs per day (Ho et al., 2018).
- In view of the negative consequences to untreated/unaided hearing loss, this study sets out to gain some insights regarding the low usage rate in Singapore.

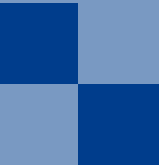


Has hearing loss + Own a hearing aid:

Hearing aid user satisfaction?



2. Aims & objectives



4. Aims & Objectives

Long term usage and satisfaction of hearing aids



Research Question #1

What is the average duration of hearing aid usage per day among hearing aid users?



Research Question #2

What is the overall level and percentage of hearing aid user satisfaction of the study sample?



Objective #1

Examine the subscale factors contributing to overall hearing aid user satisfaction of the study sample.



Objective #2.1

Determine if there is a correlation between hearing aid user satisfaction and the average daily hearing aid usage rate in this local study.

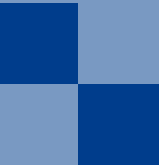


Objective #2.2

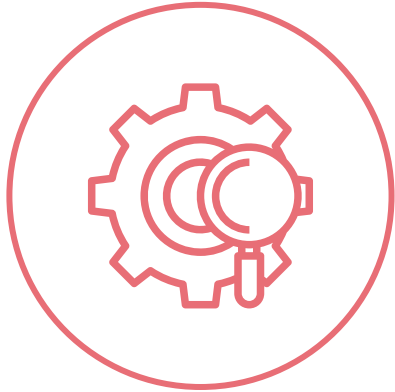
Determine any correlation between severity of hearing loss and the average daily rate of hearing aid usage.



3. Methodology



5. Methodology



**Survey
Research**

Prospective Study:

Selected measurement tool

**Satisfaction with Amplification in Daily Life (SADL)
questionnaire**

- English version (*Cox & Alexander, 1999*)
- Chinese version (*Fang et al., 2013*)

INSTRUCTIONS

Listed below are questions on your opinions about your hearing aid(s).
For each question, please circle the letter that is the best answer for you.
The list of words on the right gives the meaning for each letter.

Keep in mind that your answers should show your general opinions about the hearing aids that you are wearing now or have most recently worn.

- A Not At All**
- B A Little**
- C Somewhat**
- D Medium**
- E Considerably**
- F Greatly**
- G Tremendously**

- | | |
|--|---------------|
| 1. Compared to using no hearing aid at all, do your hearing aids help you understand the people you speak with most frequently? | A B C D E F G |
| 2. Are you frustrated when your hearing aids pick up sounds that keep you from hearing what you want to hear? | A B C D E F G |
| 3. Are you convinced that obtaining your hearing aids was in your best interests? | A B C D E F G |
| 4. Do you think people notice your hearing loss more when you wear your hearing aids? | A B C D E F G |
| 5. Do your hearing aids reduce the number of times you have to ask people to repeat? | A B C D E F G |
| 6. Do you think your hearing aids are worth the trouble? | A B C D E F G |
| 7. Are you bothered by an inability to get enough loudness from your hearing aids without feedback (whistling)? | A B C D E F G |
| 8. How content are you with the appearance of your hearing aids? | A B C D E F G |
| 9. Does wearing your hearing aids improve your self-confidence? | A B C D E F G |
| 10. How natural is the sound from your hearing aids? | A B C D E F G |
| 11. How helpful are your hearing aids on MOST telephones with NO amplifier or loudspeaker?
(If you hear well on the telephone <i>without</i> hearing aids, check here <input type="checkbox"/>) | A B C D E F G |
| 12. How competent was the person who provided you with your hearing aids? | A B C D E F G |
| 13. Do you think wearing your hearing aids makes you seem less capable? | A B C D E F G |
| 14. Does the cost of your hearing aids seem reasonable to you? | A B C D E F G |
| 15. How pleased are you with the dependability (how often they need repairs) of your hearing aids? | A B C D E F G |

SADL Questionnaire

15 questions in a 7-point rating scale

A – Not at all (1 point)

B – A little (2 points)

C – Somewhat (3 points)

D – Medium (4 points)

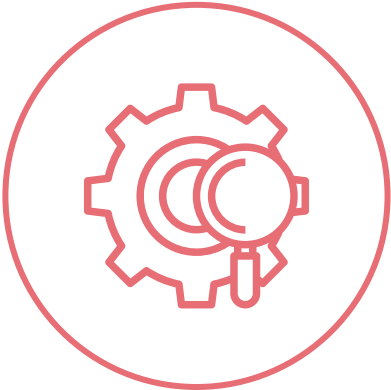
E – Considerably (5 points)

F – Greatly (6 points)

G – Tremendously (7 points)

**Categorized into 4 subscales*

5. Methodology



**Survey
Research**



**Study
Population**



Study Population



Age \geq 40 yo



Attended
audiology
service at MHC

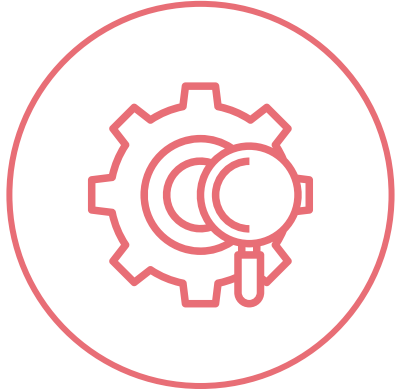


Fitted with
hearing aids
(2016-2017)



Healthy, mobile,
no prior
diagnosis of
dementia

5. Methodology



**Survey
Research**



**Study
Population**



**Recruitment
process**



Recruitment process

01. MHC patient database

N = 410



02. Eligible patients

N = 393



03. Contacted

N = 242



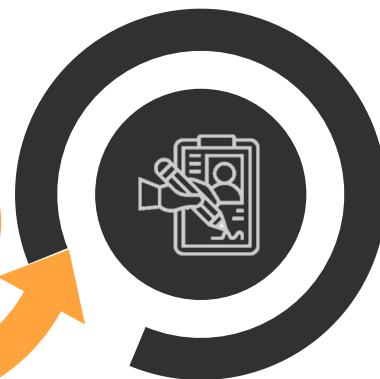
04. Appointment scheduled

N = 86



05. Final participants

N = 79

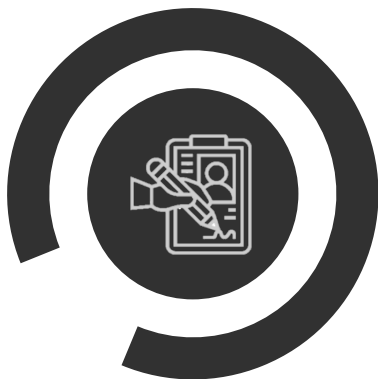




Recruitment process

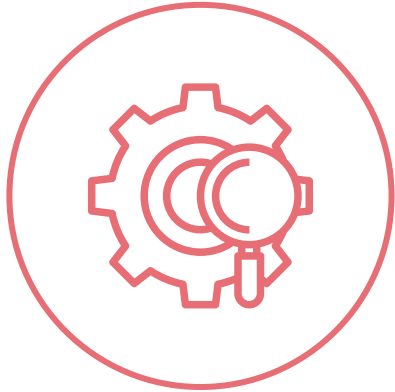
05. Final participants

N = 79



- Mean age = 70 years old
- All bilaterally fitted
- 86% moderate hearing loss and above
- 95% using Receiver-in-canal hearing aids
- 87% had >2 to 5 years of hearing aids experience

5. Methodology



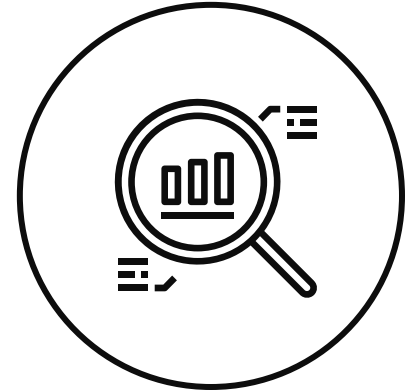
**Survey
Research**



**Study
Population**



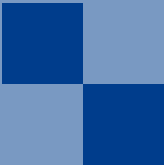
**Recruitment
process**



Data Analysis



4. Results



6. Results

Long term usage and satisfaction of hearing aids



Research Question #1

What is the average duration of hearing aid usage per day among hearing aid users?



Research Question #2

What is the overall level and percentage of hearing aid user satisfaction of the study sample?



Objective #1

Examine the subscale factors contributing to overall hearing aid user satisfaction of the study sample.



Objective #2.1

Determine if there is a correlation between hearing aid user satisfaction and the average daily hearing aid usage rate in this local study.



Objective #2.2

Determine any correlation between severity of hearing loss and the average daily rate of hearing aid usage.

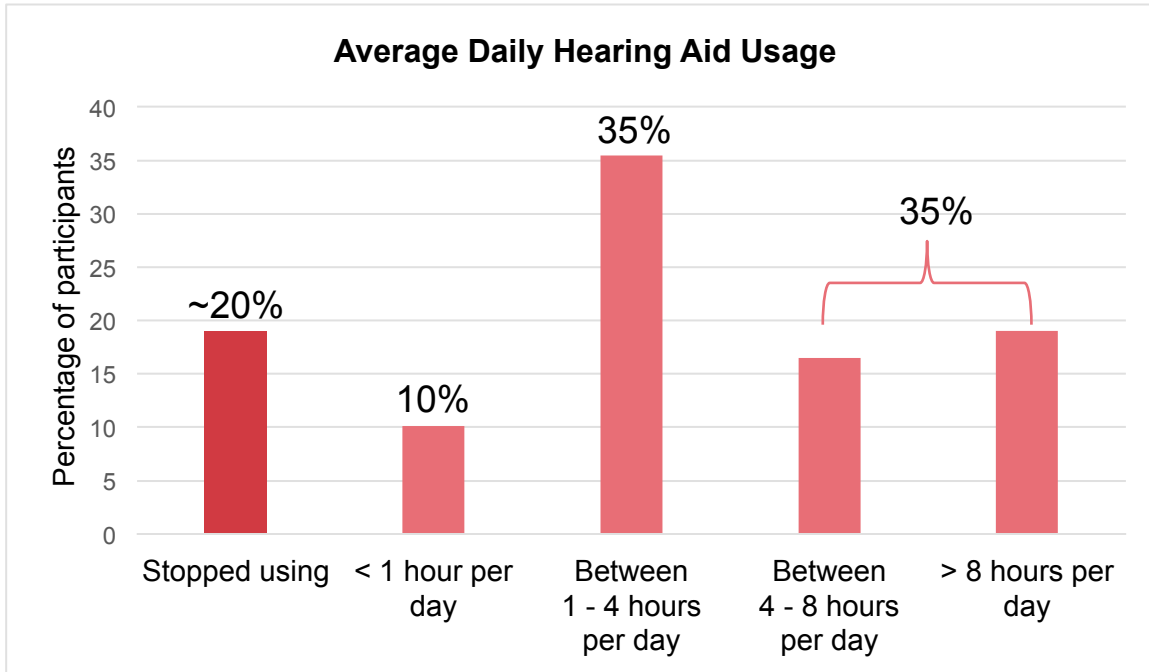
6. Results

Long term usage and satisfaction of hearing aids



Research Question #1

What is the average duration of hearing aid usage per day among hearing aid users?



- Not using: ~20%
- Current users: 80%

6. Results

Long term usage and satisfaction of hearing aids



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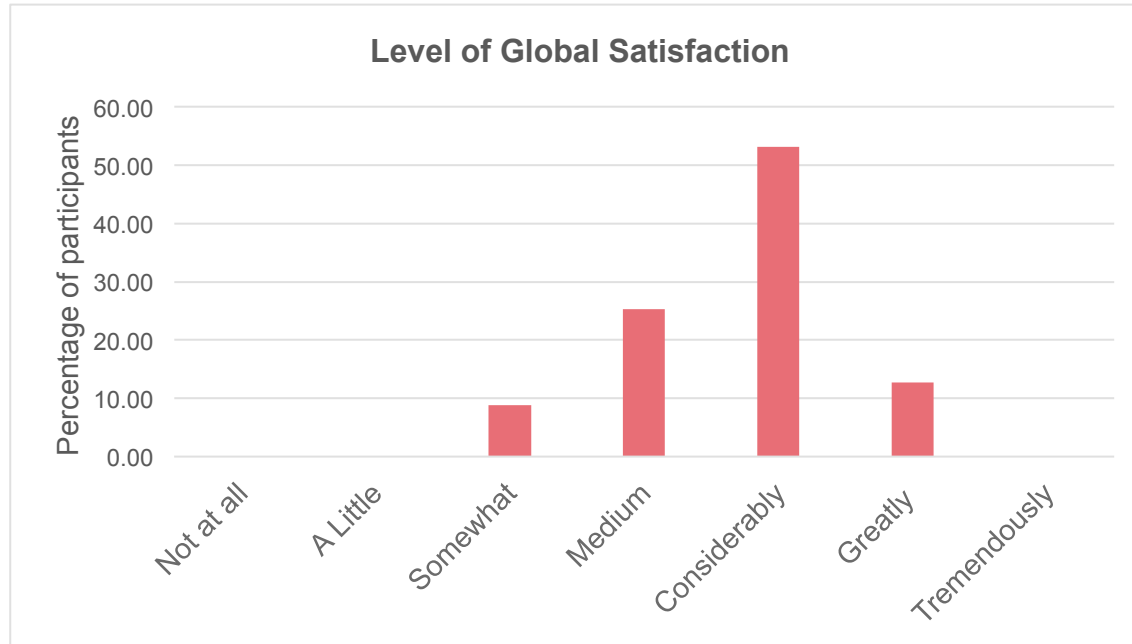
6. Results

Long term usage and satisfaction of hearing aids



Research Question #2

What is the overall level and percentage of hearing aid user satisfaction of the study sample?



6. Results

Long term usage and satisfaction of hearing aids



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6. Results

Long term usage and satisfaction of hearing aids



Objective #1

Examine the subscale factors contributing to overall hearing aid user satisfaction of the study sample.

- | | |
|---------|------------------------------|
| Item 1 | Help you understand people |
| Item 3 | Was in your best interest |
| Item 5 | Reduce asking for repetition |
| Item 6 | Worth the trouble |
| Item 9 | Improve self confidence |
| Item 10 | How natural is the sound? |

6. Results

Long term usage and satisfaction of hearing aids



Objective #1

Examine the subscale factors contributing to overall hearing aid user satisfaction of the study sample.

Positive Effects
(PE)

Item 12 Competent audiologist
Item 14 Cost seems reasonable
Item 15 Pleased with dependability

6. Results

Long term usage and satisfaction of hearing aids



Objective #1

Examine the subscale factors contributing to overall hearing aid user satisfaction of the study sample.

Positive Effects
(PE)

Service and Cost
(SC)

Item 2 Frustrated with background sound
Item 7 Bothered by feedback/whistling sound
Item 11 Helpful on the telephone

6. Results

Long term usage and satisfaction of hearing aids



Objective #1

Examine the subscale factors contributing to overall hearing aid user satisfaction of the study sample.

Positive Effects
(PE)

Service and Cost
(SC)

Negative Features
(NF)

Item 4 Others notice loss more
Item 8 Content with appearance
Item 13 Makes you seem less capable

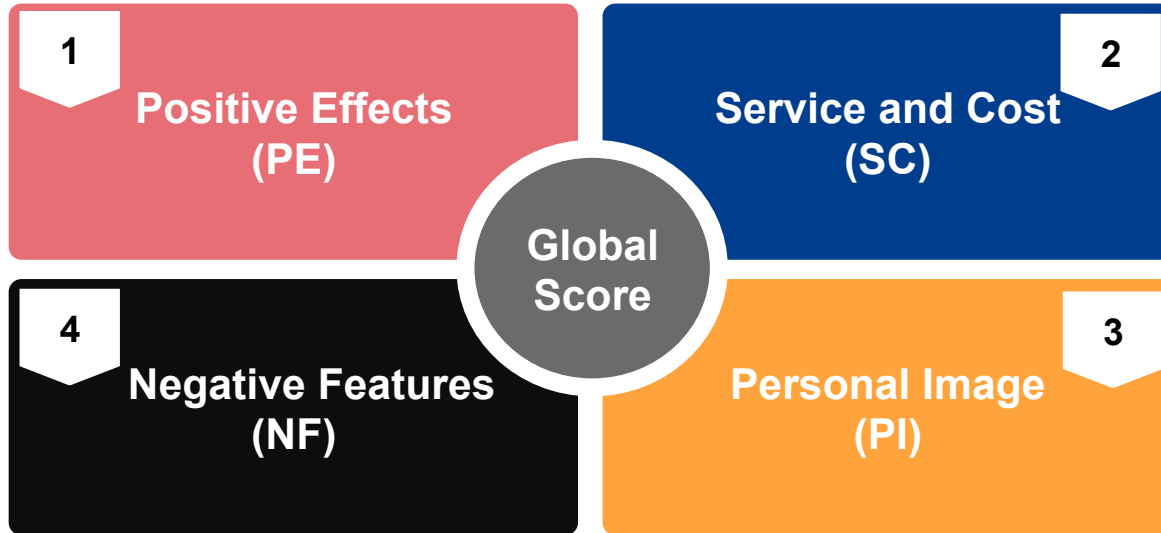
6. Results

Long term usage and satisfaction of hearing aids



Objective #1

Examine the subscale factors contributing to overall hearing aid user satisfaction of the study sample.



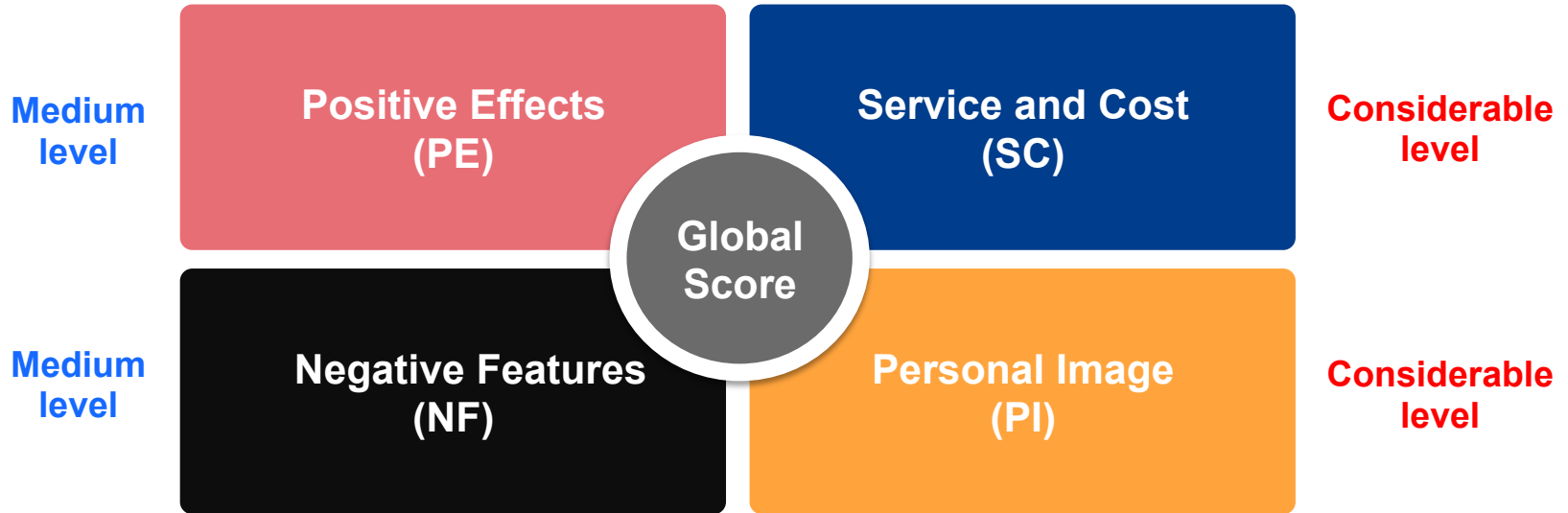
6. Results

Long term usage and satisfaction of hearing aids



Objective #1

Examine the subscale factors contributing to overall hearing aid user satisfaction of the study sample.



Satisfaction scale:

(1) Not at all (2) A Little (3) Somewhat (4) Medium (5) Considerably (6) Greatly (7) Tremendously

6. Results

Long term usage and satisfaction of hearing aids



Objective #1

Examine the subscale factors contributing to overall hearing aid user satisfaction of the study sample.



Each of the fifteen items in the questionnaire are significantly correlated to the Global Satisfaction Score. The above presents the top 5 items with strong correlation to overall user satisfaction (item-total correlation).

6. Results

Long term usage and satisfaction of hearing aids



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Examine the subscale factors contributing to overall hearing aid user satisfaction of the study sample.



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Determine if there is a correlation between hearing aid user satisfaction and the average daily hearing aid usage rate in this local study.



Objective #2.2

Determine any correlation between severity of hearing loss and the average daily rate of hearing aid usage.

6. Results

Long term usage and satisfaction of hearing aids



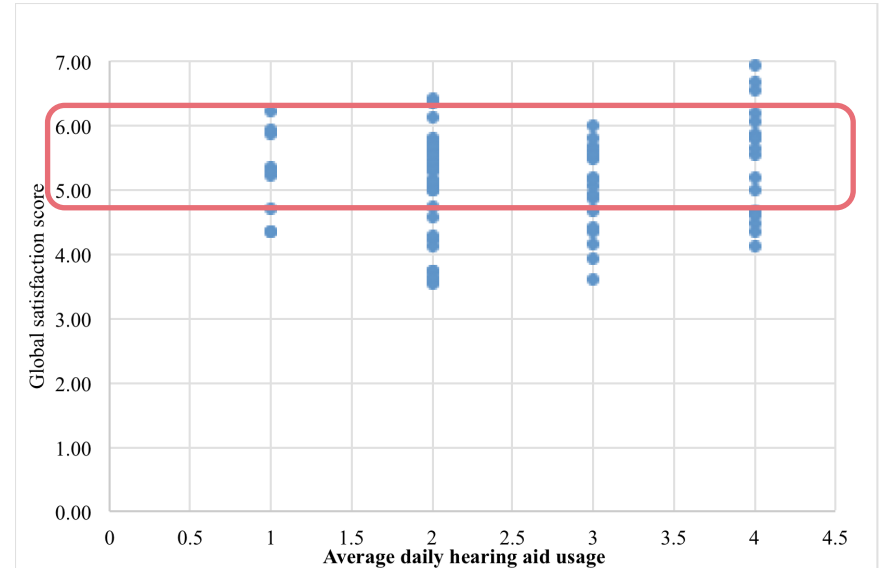
Objective #2.1

Determine if there is a correlation between hearing aid user **satisfaction** and the average daily hearing aid **usage** rate in this local study.

Spearman's rho correlation between the SADL Global and the average daily hearing aid use:

		Global Score	Average daily hearing aid use
Global Score	Spearman's rho	—	—
	p-value	—	—
Average daily hearing aid use	Spearman's rho	0.08	—
	p-value	0.48	—

* No significant correlation



Note: X-axis: Category 1 = Less than 1 hour per day; Category 2 = Between 1 to 4 hours per day; Category 3 = Between 4 to 8 hours per day; Category 4 = More than 8 hours per day

6. Results

Long term usage and satisfaction of hearing aids



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6. Results

Long term usage and satisfaction of hearing aids



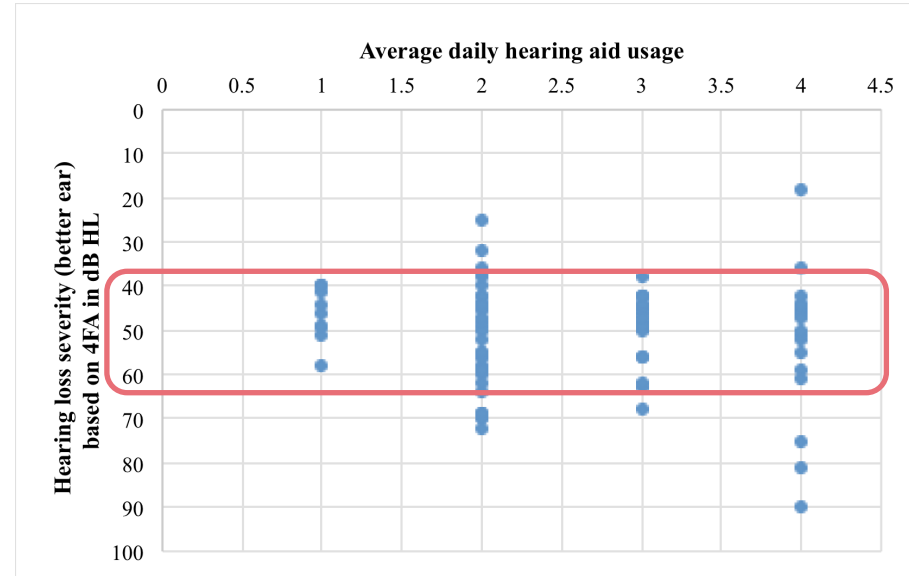
Objective #2.2

Determine any correlation between severity of hearing loss and the average daily rate of hearing aid usage.

Spearman's rho correlation between the severity of hearing loss in the better ear (dB HL) and the average daily hearing aid use:

		Severity of hearing loss (Better ear)	Average daily hearing aid use
Severity of hearing loss (Better ear)	Pearson's r	—	—
	p-value	—	—
Average daily hearing aid use	Pearson's r	0.09	—
	p-value	0.41	—

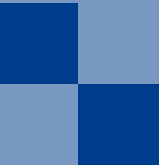
* *No significant correlation*



Note: X-axis: Category 1 = Less than 1 hour per day; Category 2 = Between 1 to 4 hours per day; Category 3 = Between 4 to 8 hours per day; Category 4 = More than 8 hours per day



5. Discussion



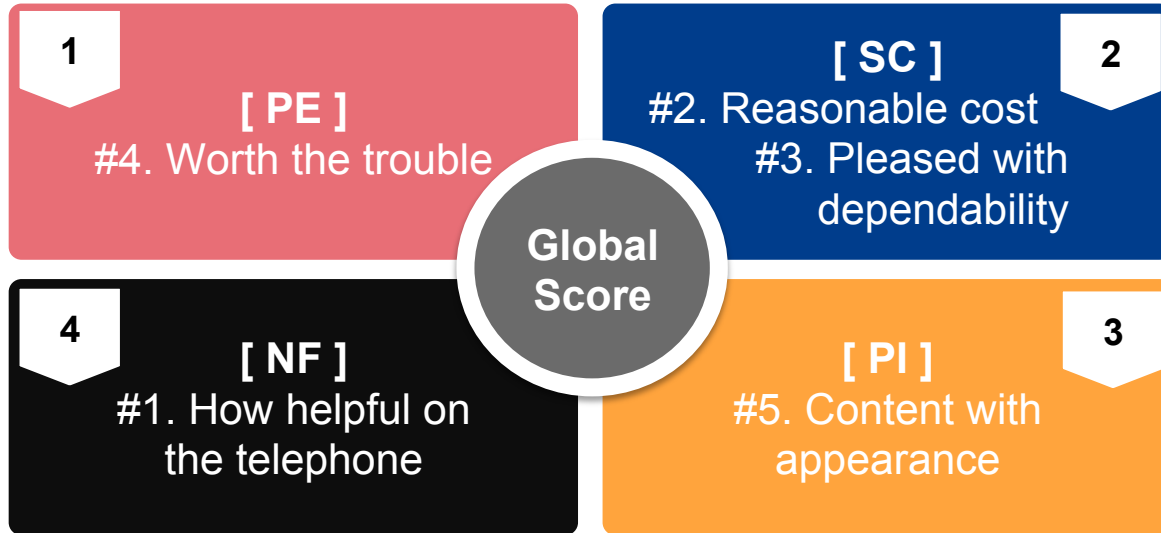
7. Discussion

Long term usage and satisfaction of hearing aids



Specific Aim 1:

To evaluate factors contributing to hearing aid users' satisfaction.



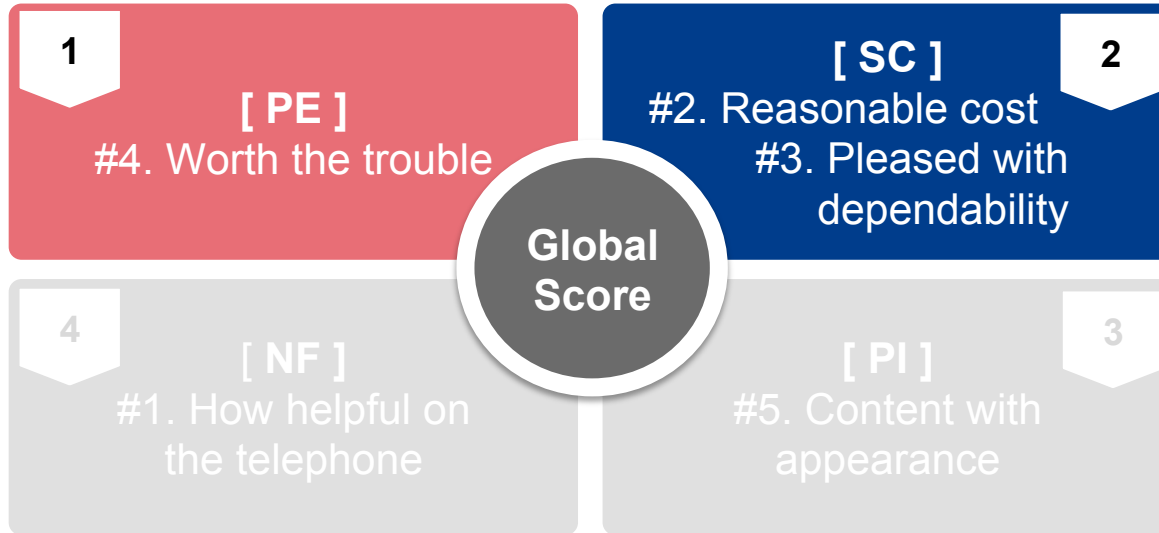
7. Discussion

Long term usage and satisfaction of hearing aids



Specific Aim 1:

To evaluate factors contributing to hearing aid users' satisfaction.



7. Discussion

Long term usage and satisfaction of hearing aids



Specific Aim 1:

To evaluate factors contributing to hearing aid users' satisfaction.

Top 5 items with strong correlations to the overall hearing aid user satisfaction:

NF #1. How helpful on the telephone

SC #2. Reasonable cost

SC #3. Pleased with dependability

PE #4. Worth the trouble

PI #5. Content with appearance

7. Discussion

Long term usage and satisfaction of hearing aids



Specific Aim 1:

To evaluate factors contributing to hearing aid users' satisfaction.

Top 5 items with strong correlations to the overall hearing aid user satisfaction:

NF #1. How helpful on the telephone

- **Medium satisfaction rating**
- Ensure that patients have the knowledge and competency of **proper telephone placement** with hearing aid use
- **Promote direct connectivity to mobile phones**

7. Discussion

Long term usage and satisfaction of hearing aids



Specific Aim 1:

To evaluate factors contributing to hearing aid users' satisfaction.

Top 5 items with strong correlations to the overall hearing aid user satisfaction:

NF #1. How helpful on the telephone

- **Considerable satisfaction rating**

SC #2. Reasonable cost

- All hearing aids were obtained with a **90% subsidy** either under the *Seniors' Mobility and Enabling Fund (SMF)* or the *Health Services Development Program (HSDP)* funding.
- Hearing aids provided at lower cost to patients (i.e. the ongoing SMF subsidy) is **effective in increasing overall user satisfaction.**

7. Discussion

Long term usage and satisfaction of hearing aids



Specific Aim 1:

To evaluate factors contributing to hearing aid users' satisfaction.

Top 5 items with strong correlations to the overall hearing aid user satisfaction:

NF #1. How helpful on the telephone

SC #2. Reasonable cost

- More unilateral than bilateral fitting reported in another retrospective local study before SMF subsidy was implemented (Ho et al., 2018). Where hearing aids are provided at low costs, patients did not hesitate to be **fitted bilaterally**.
- While the effects of the Seniors' Mobility and Enabling Fund is evident in encouraging hearing aids adoption, **the sustained usage and successive fitting at the end of the hearing aid lifespan remain questionable.**

7. Discussion

Long term usage and satisfaction of hearing aids



Specific Aim 1:

To evaluate factors contributing to hearing aid users' satisfaction.

Top 5 items with strong correlations to the overall hearing aid user satisfaction:

NF #1. How helpful on the telephone

- **Medium satisfaction rating**

SC #2. Reasonable cost

- Dependability here referred to how often the hearing aids **needed repair**

SC #3. Pleased with dependability

- Probable reason: **Relative cost for repair could appear huge** compared to how much they paid for their subsidized hearing aids.

7. Discussion

Long term usage and satisfaction of hearing aids



Specific Aim 1:

To evaluate factors contributing to hearing aid users' satisfaction.

Top 5 items with strong correlations to the overall hearing aid user satisfaction:

NF #1. How helpful on the telephone

SC #2. Reasonable cost

SC #3. Pleased with dependability

PE #4. Worth the trouble

- **Considerable satisfaction rating**
- The reasons for why hearing aids are determined to be worth the trouble or not were not assessed, but it can be inferred that the **benefits of using hearing aids outweigh the trouble** that comes with using them.
- There is a **sense of willingness** implied to using hearing aids when one finds it worthwhile.

7. Discussion

Long term usage and satisfaction of hearing aids



Specific Aim 1:

To evaluate factors contributing to hearing aid users' satisfaction.

Top 5 items with strong correlations to the overall hearing aid user satisfaction:

NF #1. How helpful on the telephone

SC #2. Reasonable cost

SC #3. Pleased with dependability

PE #4. Worth the trouble

PI #5. Content with appearance

- **Medium satisfaction rating**
- Contentment with appearance could be **associated with age** rather than the style of hearing aid which affects the visibility of device (Fang et al., 2013; Shan Kam, 2012).
- The **older generation are likely not as conscious of their appearance** as compared to younger individuals.

7. Discussion

Long term usage and satisfaction of hearing aids



Specific Aim 2:

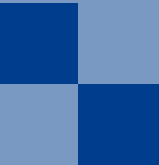
To investigate factors influencing hearing aid usage among hearing-impaired adults

No significant correlations found between hearing aid usage and (i) satisfaction and (ii) severity of hearing loss (better ear):

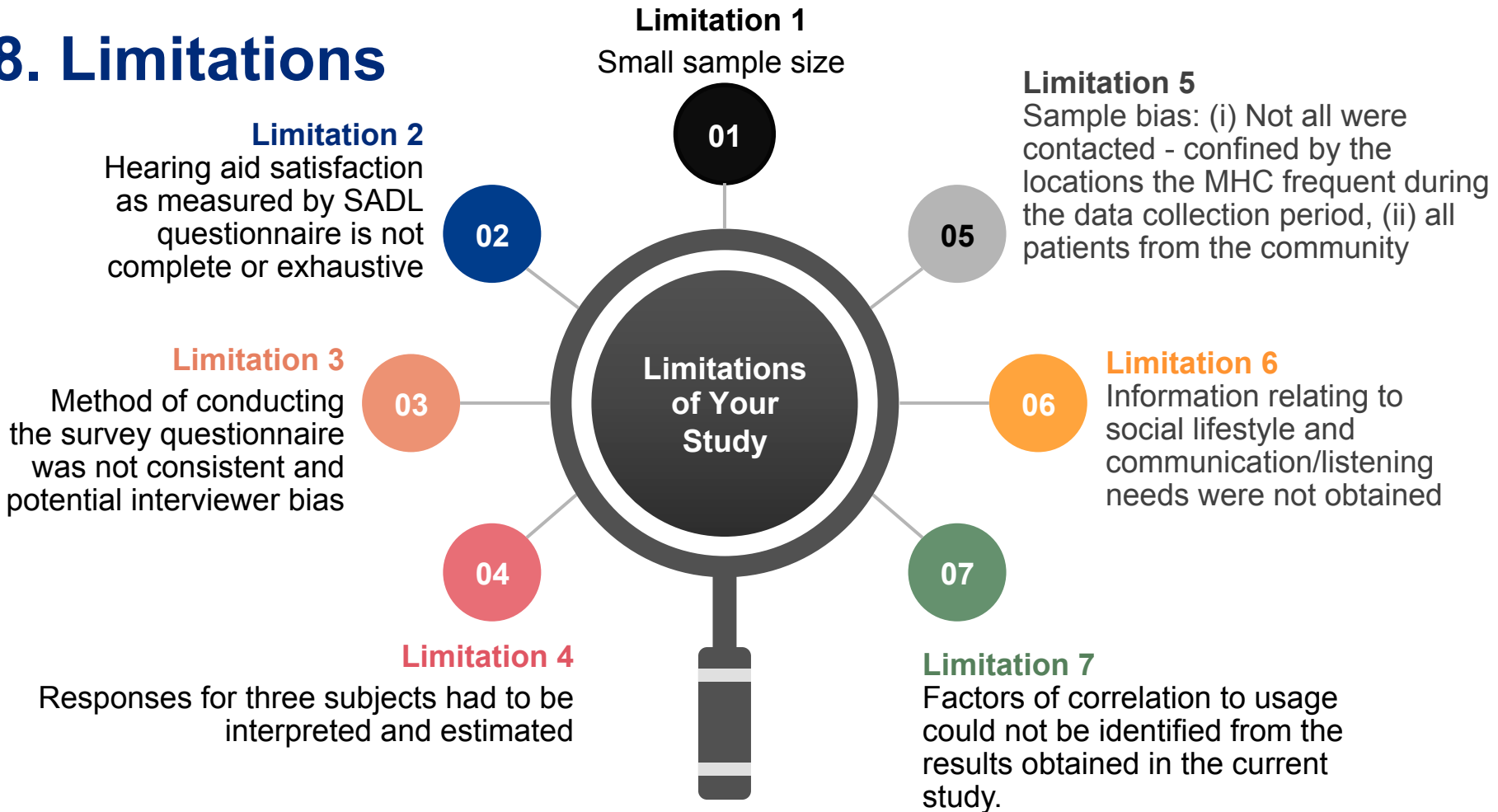
- Sample size too small to yield significant findings
- **Satisfaction \neq usage:** There are studies which showed satisfied users only using hearing aids for small amount of time. **Users only needed help for a small amount of time** (Kochkin, 1997; Harvey Dillon et al., 1999).
- **Severity of hearing loss \neq usage:** **Self-perceived hearing handicap** is a stronger determinant of hearing aid usage compared to the severity of hearing loss (Chang, Ho, and Chou 2009).



6. Limitations



8. Limitations





7. Conclusion

7. Conclusion

Long term usage and satisfaction of hearing aids

- This study provided insights on the rate of hearing aids usage and satisfaction of patients in the local community.
- Room for improvement in overcoming study limitations, e.g. larger sample size, local Chinese translation for SADL questionnaire, taking into account social lifestyle and communication needs.
- Low hearing aid usage may not be addressed by hearing aid satisfaction alone.
- Probable future research in other significant audiological and non-audiological factors that could influence hearing aid usage.

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References:

- (1) Mulrow, C. D., Tuley, M. R., & Aguilar, C. (1992). Correlates of Successful Hearing Aid Use in Older Adults. *Ear and Hearing*, 13(2). Retrieved from https://journals.lww.com/ear-hearing/Fulltext/1992/04000/Correlates_of_Successful_Hearing_Aid_Use_in_Older.7.aspx
- (2) Mulrow Cynthia, D., Tuley Michael, R., & Aguilar, C. (1992). Sustained Benefits of Hearing Aids. *Journal of Speech, Language, and Hearing Research*, 35(6), 1402-1405. doi:10.1044/jshr.3506.1402
- (3) NHS. (2010). National Health Survey 2010. Retrieved from <https://www.moh.gov.sg/docs/librariesprovider5/resources-statistics/reports/nhs2010--low-res.pdf>
- (4) Ho, E. C., Zhang, H., Ong, W. M. W., Li, K., Bei, Y. T. E., Medapati, S. V. R., & Seneviratna, A. (2018). Hearing impairment and hearing aid usage in Singapore. *International journal of audiology*, 57(4), 291-301. doi: 10.1080/14992027.2017.1420921
- (5) Cox, R. M., & Alexander, G. C. (1999). Measuring Satisfaction with Amplification in Daily Life: The SADL Scale. *Ear and Hearing*, 20(4). Retrieved from https://journals.lww.com/ear-hearing/Fulltext/1999/08000/Measuring_Satisfaction_with_Amplification_in_Daily.4.aspx
- (6) Fang, T.-Y., Chang, H.-J., Wan, T.-K., Wang, P.-C., & Chen, Y.-H. (2013). Validation of the Chinese version “satisfaction with amplification in daily life (SADL)” survey for hearing-aid users. *International journal of audiology*, 52(7), 478-484. doi: 10.3109/14992027.2013.773406
- (7) IMDA, I.-c. M. D. A. (2021). Seniors Go Digital. Retrieved from <https://www.imda.gov.sg/en/seniorsgodigital>
- (8) Shan Kam, A. C. (2012). Hearing-aid outcomes in Chinese adults: Clinical application and psychometric properties of the Chinese version of the Satisfaction with Amplification in Daily Life questionnaire. *International journal of audiology*, 51(6), 450-455. doi:10.3109/14992027.2012.670732
- (9) Kochkin, S. (1997). Subjective Measures of Satisfaction and Benefit: Establishing Norms. *Semin Hear*, 18(01), 37-48. doi: 10.1055/s-0028-1083008

References:

- (10) Dillon, H., Birtles, G., & Lovegrove, R. (1999). Measuring the Outcomes of a National Rehabilitation Program : Normative Data for the Client Oriented Scale of Improvement (COSI) and the Hearing Aid User's Questionnaire (HAUQ). *Journal of the American Academy of Audiology*, 10. Retrieved from https://www.audiology.org/sites/default/files/journal/JAAA_10_02_02.pdf
- (11) Chang, H.-P., Ho, C.-Y., & Chou, P. (2009). The Factors Associated with a Self-Perceived Hearing Handicap in Elderly People with Hearing Impairment—Results from a Community-Based Study. *Ear and Hearing*, 30(5). Retrieved from https://journals.lww.com/ear-hearing/Fulltext/2009/10000/The_Factors_Associated_with_a_Self_Perceived.10.aspx