

Noise in Aquatic Facilities: A Pilot Study on Public Exposure and Perception

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Introduction

The public is exposed to many sources of noise during their visit to indoor aquatic facilities. Splashing, loud screaming and whistle blowing are just a few examples that could lead to excessive exposure to noise. One of the more concerning auditory health effects is noise induced hearing loss (NIHL). Under the Ontario Occupational Health and Safety Act (OHSA), noise exposure for an employee should not exceed a time-weighted average of 85 dB over an 8-hour period. It is generally accepted that the same standard be adopted for the public's exposure to noise. This pilot study aimed to explore whether the public is being overexposed to noise at swimming pools across the GTA, and if so, at what levels. Currently, no other studies have been identified that have explored this topic.

Methods

- Noise assessment conducted at 8 facilities across the GTA using 2 Larson Davis Soundtrack LxT2 sound level meters (SLM)
- SLM were mounted on tripods approximately 5 feet tall, and set to A-weighting frequency and "SLOW" response
- Calibration prior to each sampling session using a Larson Davis CAL150 precision acoustic calibrator
- Public noise perception questionnaires were developed with reference to previous studies conducted by Beach, E.F., and Nie, V. (2014) and Hall, M. (2016).
- Participants selected based on convenience sampling at the time of noise assessment



Project Link (n.d.)



Hall, M. (2016)

Results

Figure 1. – Equivalent continuous A-weighted (LAeq) sound pressure levels by activity (N=22)

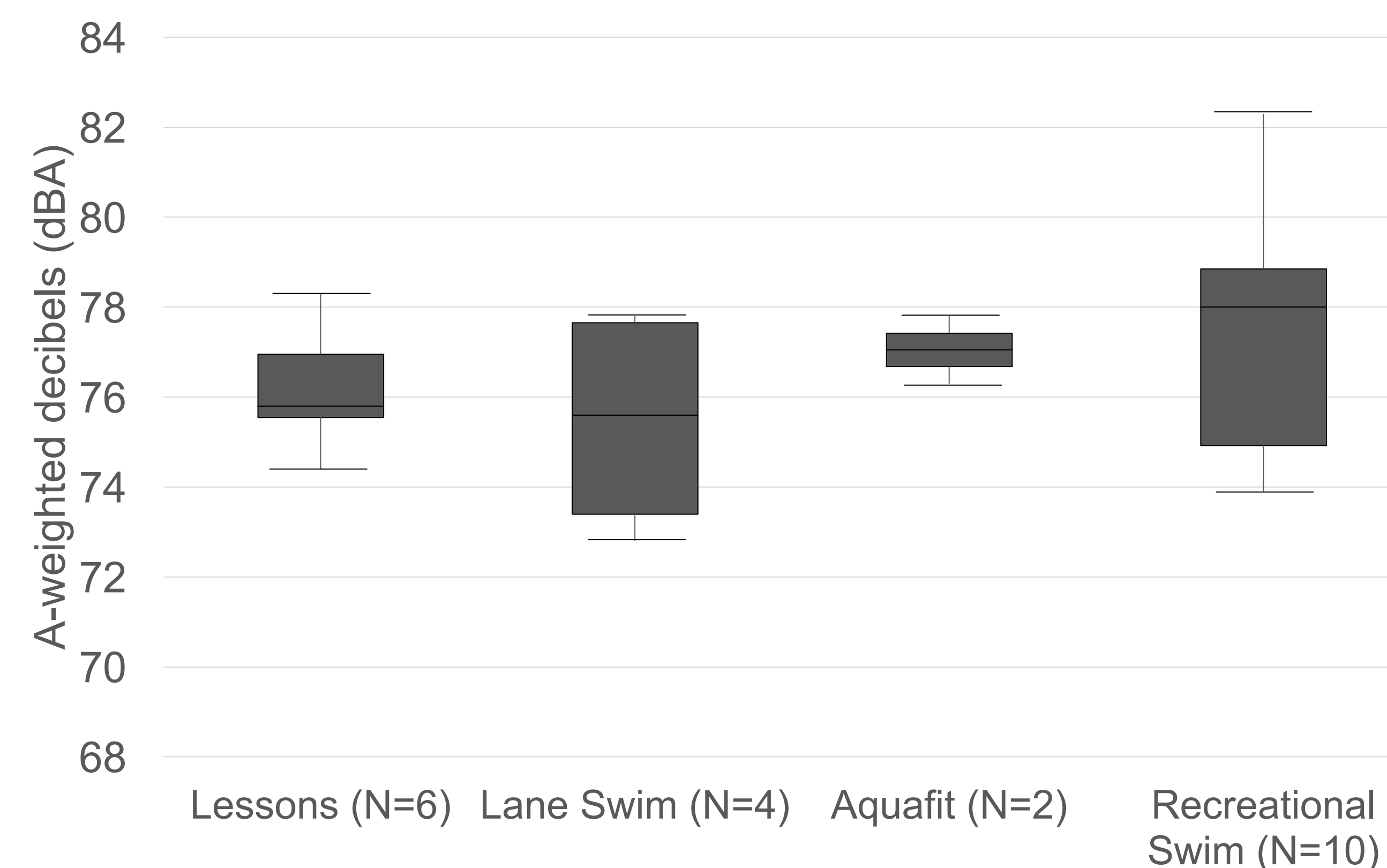


Figure 2. – Participant responses to "How would you rate the pool today in terms of noise?" (N=45)

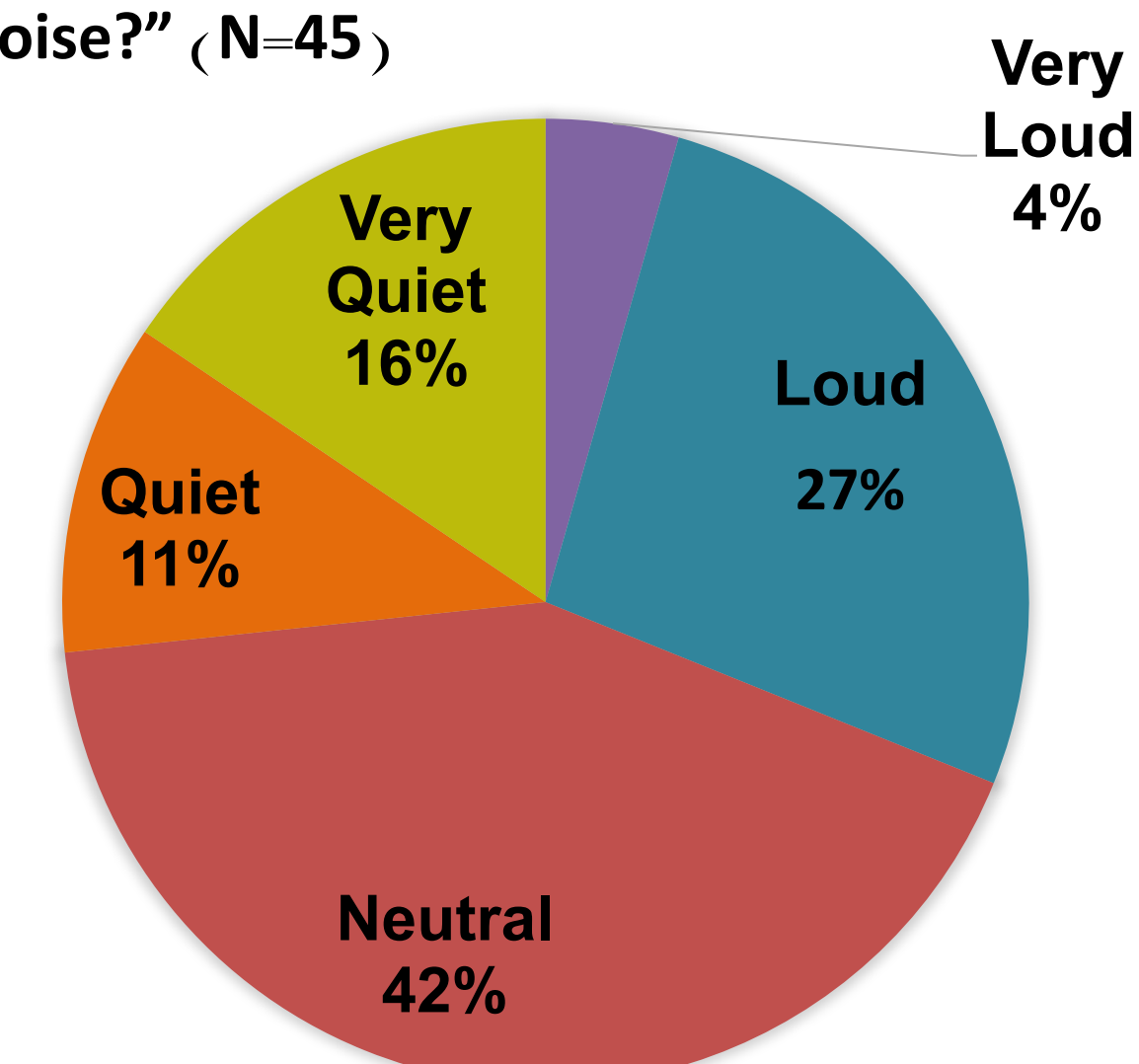


Figure 3. – Participant Responses to "How loud is the pool when at its noisiest?" (N=45)

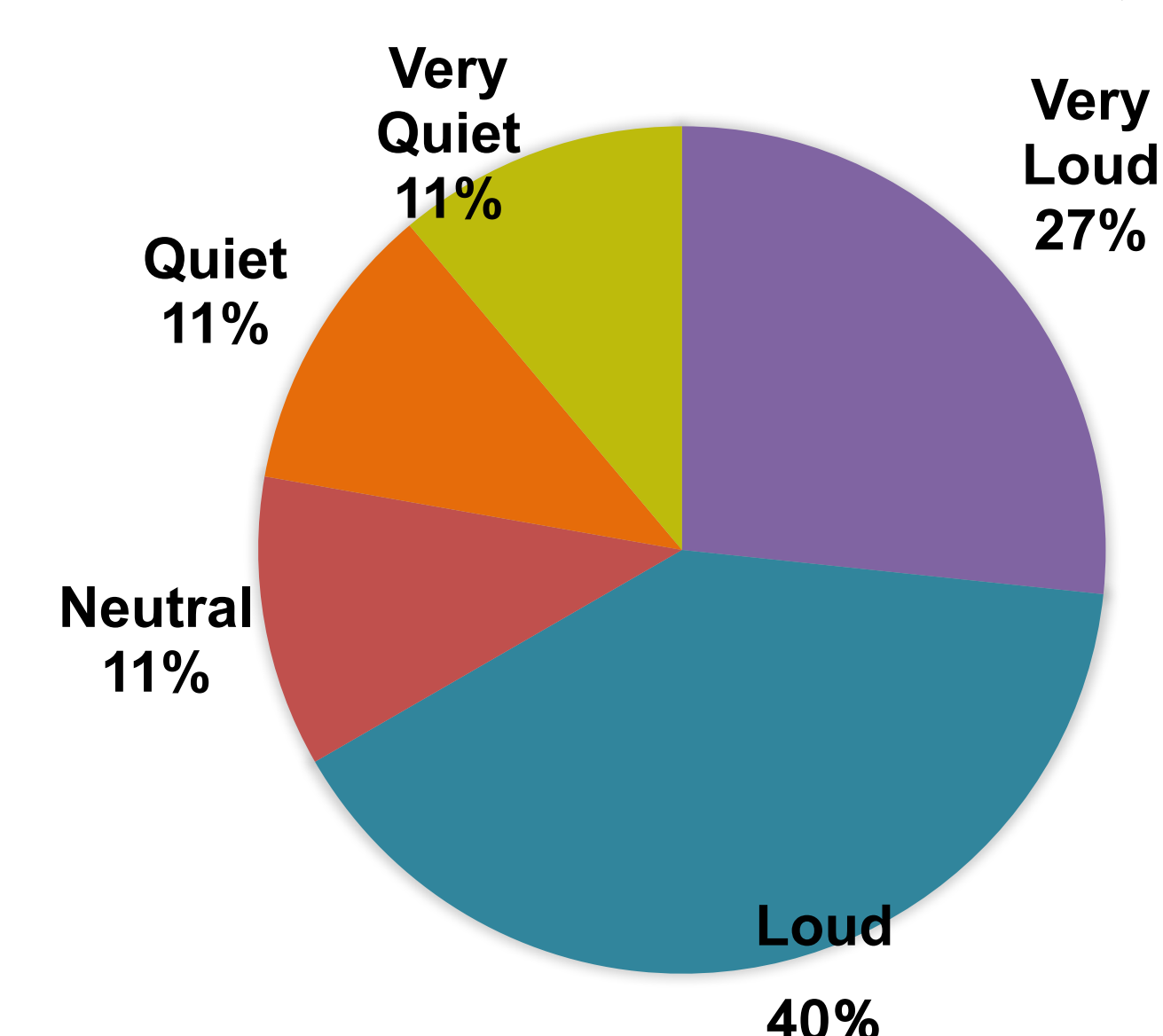


Table 1. – LAeq and peak (LApeak) sound pressure levels by location (N=11)

Activity	LAeq (dB)	LApeak (dB)	LAS >85dB exceedance count/duration
Site A Lessons	75.9	110.6	9/36.6s
Site B Lane Swim	73.6	102.2	0/0s
Site B Aquafit	77.8	108.4	1/2.7s
Site B Lessons	78.3	104.5	16/39.5s
Site C Recreational Swim	82.3	111.7	117/499.5s
Site C Recreational Swim	78.9	109.8	24/62.2s
Site D Recreational Swim	74.6	108.9	2/3.7s
Site E Lane Swim	77.8	108.7	2/5.8s
Site F Recreational Swim	75.9	109.8	11/26.8s
Site G Lessons	75.7	115.1	21/56.3
Site H Recreational Swim	78.7	122	41/114.2s

Discussion

Although the LAeq did not exceed the legislated standard, the peak sound pressure levels (LApeak) were high (102.2–122 dB). This is alarming when compared to the permissible exposure time based on the OHSA exchange rate of 3 dB (Table 2). Individual susceptibilities may also predispose some individuals to experiencing negative health outcomes at lower thresholds. Despite the fact that noise levels were high, the public overall felt indifferent (Figure 2). When asked about noise levels when the pool is at its noisiest, a higher proportion of respondents answered 'loud/very loud' (67%) when compared to only 31% who responded 'loud/very loud' to the current noise levels. This indicates the further need to explore noise levels in indoor aquatic facilities in the GTA.

Table 2. – Permissible Noise Exposure (3dB Exchange Rate)

dB	Permissible Exposure Time
103	7 min 30 sec
106	3 min 45 sec
109	112 sec
112	56 sec
115	28 sec
118	14 sec
121	7 sec

References

- Beach, E.F., and Nie, V. 2014. Noise Levels in Fitness Classes Are Still Too High: Evidence From 1997–1998 and 2009–2011. *Archives of Environmental & Occupational Health*. 69(4): 223–230.
- Hall, M. 2016. *Acoustic Design of Swimming Halls* (Master's Dissertation). Retrieved from http://www.akustik.lth.se/fileadmin/tekniskakustik/publications/tvba5000/webTVB_A5048.pdf.
- Project Link. (n.d.). *LxT sound level meter from Larson Davis* (Infographic). Retrieved from https://www.projectlink.com.au/m/view_description/31876.

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