

Fan assisted radiators

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Human factors

- It is all well and good designing a high performance product but what if the end users...
 - don't actually want what you are offering?
 - or
 - end up using it incorrectly?
- Taking account of the human factors can lead to a more user centred design which will;
 - increase user acceptance,
 - reduce misuse,
 - improve performance,
 - and hopefully increase adoption / sales.

Asked to....

- Ascertain areas of concern or issues related to the use of fans on radiators from a human factors perspective.
- Identify areas which may benefit from further investigation.
- Recommend ways in which any further investigations may be conducted.



Approach

- Conduct an initial review of products available on the market.
- Identify questions / areas that may be an issue / concern to their use (potential 'Aspects to consider').
- For each 'Aspect to consider' conduct an initial investigation, using existing data / literature.
- Identify aspects that would benefit from further investigation.
- Propose methods to further investigate specific aspects in more detail.

Aspects to consider – an overview

- **Sound levels**
 - Loudness (Sound pressure levels – ‘A’ weighted (dB(A))
 - Subjective response – annoyance, auditory discomfort, interference, age, tasks etc..
 - Affect of context of use, additive sound, room acoustics, distance from product
- **Air flow**
 - Warm draughts / cold draughts
 - Subjective response, thermal comfort
 - Air quality
 - Dust
- **Control of the fans**
 - User requirements
 - Responsibility of control
 - Ease of use
- **Installation**
 - Cost
 - Practicalities – current location of radiators/ electricity
 - Upheaval
 - Appropriateness – a well insulated property.
- **User behaviour / acceptance**
 - Compensating behaviour, misuse, space, etc..

Fan sound

Method

- Market review of 26 products from 3 manufacturers:
 - Myson
 - JAGA
 - Dimplex
- Ascertain sound pressures levels of a range of products (as provided in product brochures)
- Compare to relevant sound level data / guidance / research data.

Fan sound

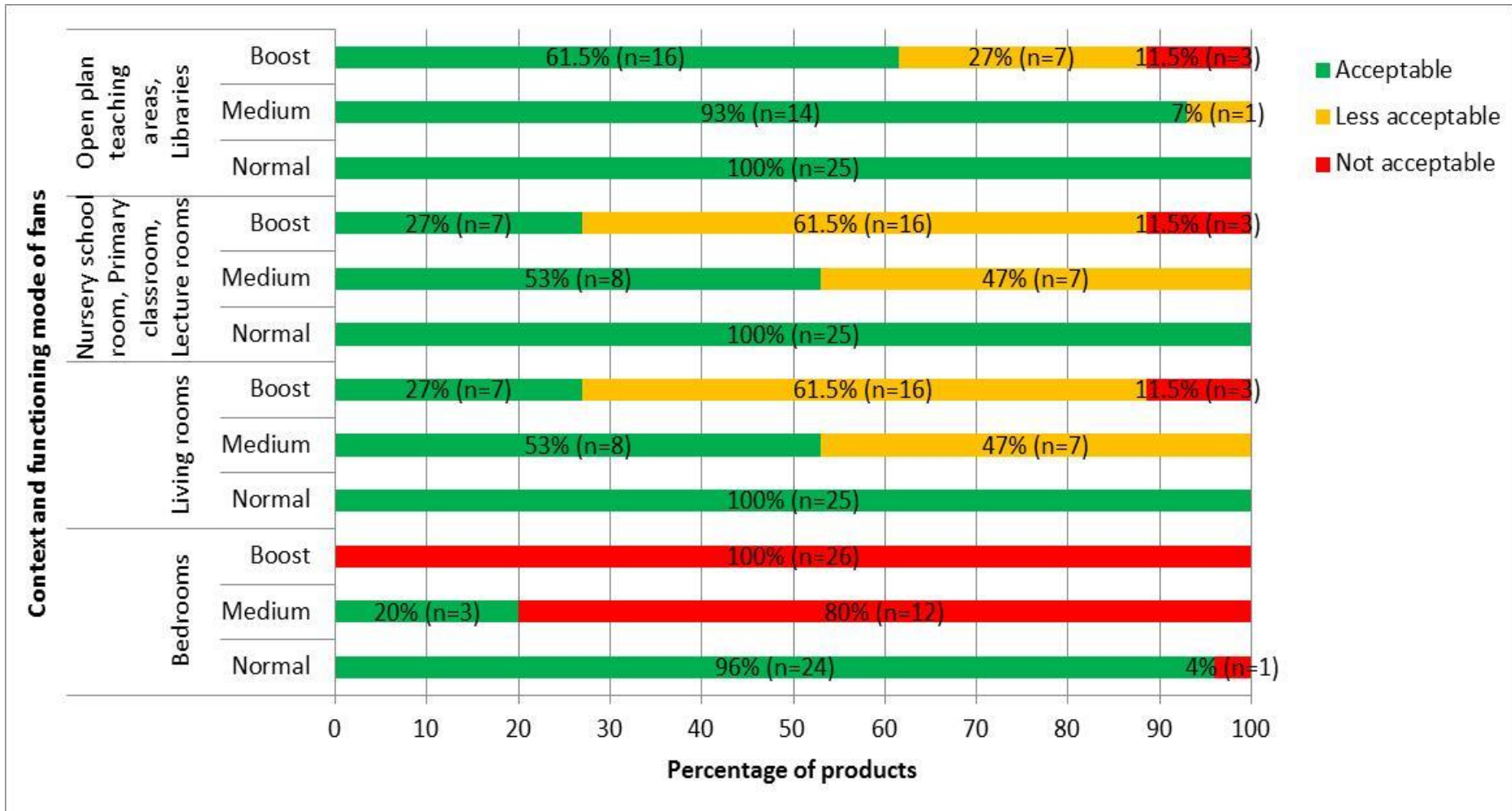
- Fan assisted radiators – Pre-set temp, Boost, Medium, Normal/comfort modes of fan operation.

Fan sound into context

Example sources / context	
Sound level dB(A)	Example sources / context
55	Low volume of radio or TV (1m)
	Noisy vacuum cleaner at 10m
50	Light traffic at 30m away
45	Noise of normal living; talking, or radio in the background
≥ 35	Living room area- speech intelligibility and moderate annoyance, daytime and evening.
35	Very quiet room fan at low speed at 1m
≥ 30	Bedrooms- Sleep disturbance, night time
25	Sound of breathing at 1m
15	A whisper

Fan assisted radiators reviewed			
Sound level ranges dB(A)	At 2.5m in accordance with ISO 3741		
	Normal/comfort	Medium	Boost
≤ 50	0	0	11%
≥ 40 and < 50	0	7%	27%
≥ 35 and < 40	0	40%	35%
≥ 30 and < 35	4%	33%	27%
< 30	96%	20%	0

Noise guidelines and radiator fan function mode sound levels



Limitations of using sound level data

Data in the guidance documents has been used only to provide a baseline context, as:

- Sound measurements presented by the manufacturers are measured within a controlled environment.
- The acoustics of the environment where the product will be used will differ i.e. context of use, additive sound, room acoustics, distance from product etc.
- There is no available scale that fully succeeds at measuring noise from an annoyance point of view.

Next steps.....

Task	Aims	Potential Methods
Stage 1. Fact finding Evidence building for stage 2	Filling current information gaps	Contact manufacturers / suppliers for face to face meetings. Review / follow up existing case studies. Informal interviews with users of fan assisted radiators – case studies. More detailed review of the literature.
Stage 2. User acceptance	To further investigate what characteristics of; <ul style="list-style-type: none"> • Sound • Airflow • Controls people like, dislike, or could not accept. Look at how these map onto current designs, identify aspects of matches / mismatch.	Questionnaires Focus groups / scenarios Experimental studies Explore current ambient room sound levels User requirements analysis
User behaviour / error analysis	Possible consequence of not matching user requirements.	Task analysis / Error analysis

Next steps.....

- Are there other ancillary equipment / products related to your work that would benefit from a human factors input?