Pet Brush Verification Plan

Group C	
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Design Requirements

6 design requirements are established to satisfy user needs, which are listed in Appendix A.

Testing Methodology/ Verification Plan

Tests will be conducted for each design requirement (as described in Appendix B). The data will be recorded in a spreadsheet and used to compute a score using the testing scorecard.

Testing Scorecard

A testing scorecard (in Appendix D) is generated based on the correlation matrix in Appendix C. Design changes made can be judged against this (design changes should raise the overall score).

References

[1] L. Barone, M. Faizul, D. Haikal, & R. Rutiser Sundar, "Pet Cleanup Project Problem Definition Review,"
https://github.com/rutisersundar1/ENGR1182GroupC/blob/main/Technical%20Documentation/Problem%20Definition%20Review.pdf
(accessed Apr. 20, 2022)

Appendix A: Design Requirements

Design Requirements	Value Range	Ideal Value	Design Impact
Time to clean hair out of brush	0 - 120 seconds	< 30 seconds	Bristles modified to lower value (easier to use)
Total brush mass	0 - 500 g	< 100g	Parts optimized for lower mass (lighter)
Brush material cost	$0-10	< $5	Optimized for lower cost (cheaper brush)
Force to break one bristle	0-3 lbs	> 3 lbs	Bristle must withstand normal use (higher breaking force is better)
Brush strokes to adequately clean pet	1-10	< 3	Bristles modified to lower value (quicker cleaning)
Pet opinion	1-10	> 8	Bristles modified to minimize discomfort and increase pet opinion (more pet-safe)

Appendix B: Testing Methodology

- Time to clean out hair brush: The hair brush will be used for some time until it has some hair trapped in it. A timer will be started, and the amount of time required to remove the trapped hair (fewer than 20 hairs remaining) will be recorded. This emulates the typical use of a hair brush. 5 trials.
- Total brush mass: The brush will be cleaned of any trapped pet hair and its mass will be taken. 1 trial
- Brush material cost: Using brush CAD models, the cost of the brush materials will be calculated. This does not include the cost of manufacturing, as the manufacture of the prototype is significantly different than the manufacture of a mass-market prototype. 1 trial.
- Bristle breakage force: One bristle, mounted to a base, will have a force applied to its tip horizontally and will be tested to destruction. The final failure force will be recorded. This test aims to ensure that a bristle design is not fragile and can stand up to usage, drops, and handling. 3 trials.
- Brush strokes to adequately clean pet: The brush will be used on a small section of a pet. Brushing continues until there is no more significant accumulation of fur on the brush (fewer than 20 individual hairs on the last stroke with no large clumps), which is cleaned between strokes. The number of strokes is recorded. 5 trials.
- Pet opinion: The brush will be used on a pet. Brushing continues for up to five minutes. A score from 1 (bad) to 10 (good) is given based on whether the pet seems to enjoy the brushing. 3 trials.

Appendix C: Correlation Matrix

Prototype Requirements Correlation --------------------------- User Needs	Time to clean hair brush	Total brush mass	Total brush material cost	Force to break one bristle	Strokes to clean pet	Pet Opinion	Weight from PDR [1]
Pet-safe					3	9	5
Fast	9				9	3	0
Affordable			9				1
Helpful	3	1		1	9	3	4
Reliable				9			2
Easy to use	9	3		3	9	3	3
Importance	39	13	9	31	78	66	

Appendix D: Final Testing Scorecard

Requirement	Range	Score Rubric									Score
		8	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	
Time to clean hair out of brush (5 pts)	0 - 120 seconds				≤80 s	≤90 s	≤100 s	≤110 s	≤120 s	>120 s	
Total brush mass (1pt)	0 - 500 g								<250g	>250g	
Brush material cost (1pt)	$0-20								< $10	> $10	
Force to break one bristle (3pts)	0-3 lbs of force						≥ 3 lbs	≥ 2 lbs	≥ 1 lb	< 1 lb	
Brush strokes to adequately clean pet (8pts)	1-10	1	2	3	4	5	6	7	8	≥ 9	
Pet opinion (7pts)	1-10		10	9	8	7	6	5	4	<3	

Appendix E: Group Responsibilities

P1.6: Verification Plan "Mini" Presentation			
Project Manager for Assignment		Ranga Rutiser Sundar	
Deputy Manager for Assignment		Angelina Barone	
Drafted Assignment	All group members	**Revised Assignment**	All group members
Reviewed Assignment	All group members	**Proofread Assignment**	All group members
Created Figures	Mira Faizul	**Created Tables**	Dan Haikal
Other Contributions			
N/A			
Problems Overcome			
The group was able to verify its design by defining design requirements and carrying out a series of tests and measurements.			