

Prototype Testing:

Engineering Metric Being Tested: Percent of Diverted Urine

Purpose:

The purpose of this test is to determine a threshold for approximating how effective the designed urine diverter functions.

Goals:

The ideal urine diverter will divert 100% of the applied urine with no splashback experienced by the user. While it is assumed that the designed diverter may not be able to divert 100% of the urine each and every time, a tolerance of +/- 5% will be applied to this model to account for any possible deviation from this target.

Conclusions:

The conclusions drawn from this study suggest that splashback did not occur with this test population of 23 participant users of the urine diverter and dry toilet prototype system. However, quite a few of the participants uses of the toilet resulted in soaked paper towels of urine inside the toilet, indicating some user experiences would lead to more urine going into the feces bucket than others.

Materials:

- Human Subjects Testing survey
- Google Sheets (formulas and functions)

Procedure:

- 1.) Conduct Human Subjects Testing with more than 10 participants.
- 2.) Pull results from the two questions relating to Splashback.
- 3.) Graph and model the data to search for trends from which insights may be gathered.
- 4.) For those who reported high levels of splashback, review their qualitative responses to extract useful information surrounding the negative result.

Results:

	A	B	C	D	E	J	K	N	O
1	Timestamp	Please enter your unique, randomly-generated participant ID number:	Age:	Participant height:	Medical sex	Did you experience any splashback?	If so, please rate the level of splashback experienced:	Do you have any other comments or suggestions regarding the diverter designs?	Do you have any other comments or suggestions for us?
3	3/19/2018 15:07:25	14	22	5 ft 4 in	Female	No	3	No	No
10	3/26/2018 16:25:16	17	21	5'5"	Female	No	5		
12	3/26/2018 16:49:36	21	22	5' 8"	Male	No	5	Increase the size of the seat.	Worked well.
13	3/26/2018 16:55:30	31	23	5' 7"	Male	No	5	Pants brush up against the body of the toilet	
14	3/26/2018 17:02:08	33	22	5' 3"	Female	No	5	The liquid collection portion seemed to be too far forward for me and there was a bit of overflow into the back section	
19	3/28/2018 15:37:52	25	21	5' 11"	Male	No	5		
23	3/28/2018 16:37:24	13	25	5'5"	Female	No	5	even though i did not experience splash back on myself, it did seem that there were some splash around the container as if the urine was not properly funneled into the jug	
25	3/28/2018 16:54:02	27	23	6'00"	Male	No	5	It seems quite compact or close to the body for those people of larger stature/size to use	If there was more space in the front wall of the diverter (or in this case the toilet), it may reduce the amount of splashback that there may be.

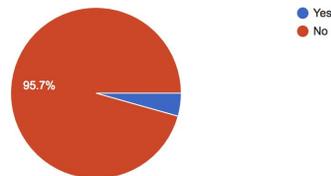
Percent of participants saying they experienced splashback (rating response given) = 34.78%

Ratings frequency for level of splashback experienced = 5 (x7) + 1 (x3)

Analysis:

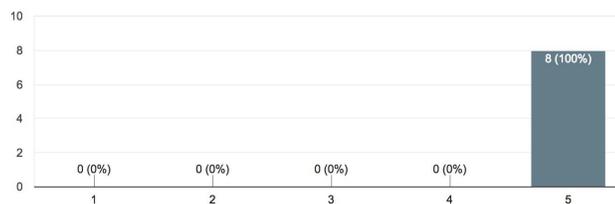
Did you experience any splashback?

23 responses



If so, please rate the level of splashback experienced:

8 responses



The behaviour exhibited in the results is rather interesting and somewhat conclusive. It appears that 7 total participants claimed a rating level of 5, indicating “Some Splashback.” There are two ways this can be interpreted. One is as a real entry and two is as user/form error.

If these are real assessments of splashback, then this is a somewhat significant number. The qualitative responses should then be regarded more heavily.

If they are due to user error in interpreting that the question was optional or form error in not making that more salient or offering a zero splashback end of the spectrum of splashback experienced as a contingency, then this would likely not be as useful.

It appears the qualitative results suggest that a minor degree of splashback was experienced if the term is interpreted as meaning urine splashing back into the inner workings of the toilet, not necessarily that urine splashed against the user's body. This can be further explored through breakdown of the diversion of urine in tandem with results of other test protocols.

Ultimately, much of the qualitative responses to the last two questions are suggesting that -- and this is something that those test proctors responsible for cleaning between each trial observed -- urine was not entirely making it down the urine diverter. Test proctors claimed that various participants use of the toilet would result in more urine spilled in the back of the toilet than would be ideal, though much of this was reduced when a clear instruction was added in the setup of the HST protocol letting users know to seat themselves carefully on the prototype so as not to risk misaligning the urine jug with the end of the diverter.

In assessing with the location of spillage that would occur, it appears as though the back of the diverter would indeed do what is intended and catch what participants would have deemed "spilled" urine actually in the feces bucket. In other words, the system would work as intended. Though, the critical findings here suggest that the back of the diverter that dips into the bucket, that side should contour less, and rather be more of a steep drop to reduce just how much urine does go into the feces bucket.