A randomized controlled study investigating the effects of a multiple-blade pivoting head metal razor design on safety, satisfaction, speed and NPS® in shavers currently using modern plastic razors.

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The purpose of this study was to evaluate the impact of merging modern shaving razor features (multiple blades and a pivoting head) with traditional plastic-free safety razors, according to people who also have no experience using plastic-free shaving razors. Women and men who self-identified as having no previous experience using any type of safety razor were recruited from social media. A pre-study survey was issued to assess usage and satisfaction metrics surrounding the participant's current shaving razor. Following the completion of the pre-study survey, participants were randomized into three groups: Group 1 (Control Group, who will proceed to continue shaving with their current plastic-disposable razor); Group 2 (Traditional Safety Razor) who received a double-edge safety razor; or Group 3 (The Leaf Razor) who received a multi-blade pivoting-head safety razor. Participants recorded metrics (*how long their shave took; how many adverse safety events occurred; how satisfied they were with the razor; how close the shave was; and their likelihood to recommend the razor to a friend or colleague*) around their shaves for the next 3 months, or until they met a minimum 15 shave reports submitted. A post-study survey was administered. The results of the pre-study and post-study surveys were analyzed, and the accumulated data from over 1,500 shave reports were analyzed.

Participants measured adverse safety events (defined as minor, medium or severe nicks or cuts during the shave) across all three groups. Group 1 (Control Group) recorded adverse events in 32.8% of their shaves. Group 3 (The Leaf Razor) recorded adverse events in 25.6% (a reduction compared to the Control Group), and Group 2 (Traditional Safety Razor) recorded adverse events in 46.9% of their shaves, an higher rate compared with the two other groups. When we compare the severity results between the Group 3 (The Leaf Razor), and Group 2 (Traditional Safety Razor), Group 3 (The Leaf Razor) experienced a 48% reduction in Medium-Level events; and a 66% reduction in Severe-Level events ($p < 0.001$).

At the close of the study when asked to rate the perceived safety of the razor used, we saw a 33% **increase** in the reported safety from Group 3 (The Leaf Razor) compared with the Group 2 (Traditional Safety Razor) ($p < 0.001$). A 14% **reduction** in reported safety was found when moving from Group 1 (Control Group) to Group 2 (Traditional Safety Razor) ($p < 0.05$).

An overall increase in satisfaction (73% increase) was observed in Group 3 (The Leaf Razor) when comparing their post-study survey results with their pre-study survey results, whereas no change in satisfaction occurred within Group 1 (Control Group) ($p < 0.001$). A smaller increase in satisfaction (23% increase) was observed in Group 2 (Traditional Safety Razor) ($p < 0.05$). And overall, participants in Group 3 (The Leaf Razor) were 26% more satisfied when compared to Group 2 (Traditional Safety Razor) ($p < 0.001$).

When looking at Net Promoter Scores (NPS®) which range from -100 to +100: Group 3 (The Leaf Razor) participants exited the study with a NPS of +77; Group 2 (Traditional Safety Razor) exited the study with an NPS of +7.

In summary, a more modern safety razor with two key modern features (a pivoting head and multiple blades) increases the safety of shaving plastic-free, increases satisfaction with the razor, and increases the likelihood of the user's desire to recommend the razor to a friend. However, these data and results have some limitations through study design, namely that the participants were inclined to be open to alternatives by virtue of applying to the study; and also that the study administration was performed by Leaf Shave although good study design was practiced including blinding of the groups during data analysis. Additional research is needed to examine if similar results can be replicated across users with no previous knowledge of The Leaf Razor, and who are currently satisfied with their disposable plastic shaving razor.

INTRODUCTION

Disposable single- or low-use plastic products are at the center of public conversations about the ongoing ecological and environmental disaster that is global climate change. Consumers are increasingly acting against unnecessary waste. There has been a recent groundswell of support against petroleum-based plastic products. The goal is to reduce or eliminate our unnecessary plastic waste. One of the issues with more sustainable or plastic-free solutions in the consumer product space is efficacy. However, consumers are dissatisfied losing fidelity when using plastic-free / low-waste alternatives. A perfect illustration of this problem is the issue with paper-straws when compared with plastic-straws. Or cleaning products that don't clean as well.

In shaving razors, plastic-free alternatives have existed for more than a century. The traditional double-edge safety razor was invented in 1905 by King C. Gillette. It wasn't until the 1960's when global commercial giants started taking advantage of the proliferation of plastic-in consumer packaged goods and making razor handles out of plastic. These fully disposable razors were cheap for consumers to buy, and were designed to be thrown out after limited use. In the 1980's shaving companies released the first disposable plastic-cartridge razor "systems." This innovation was designed around proprietary blade replacements to keep consumers locked in with switching costs (other cartridge blades would not fit the handles the consumer invested in). This is the classic embodiment of the eponymous Blade-and-Razor business model.

One of the reasons that plastic-razors and cartridge systems supplanted the more eco-friendly safety razor options were in the more advanced user design features that these companies

engineered into their products. Traditional double-edge safety razors are marked by their increased technical hurdle during use, higher learning curves, a lower "safety net" against nicks or cuts during shaving. This tradeoff illustrates the issue raised above wherein modern consumers are concerned with reduced efficacy or ease-of-use when moving from more wasteful solutions to eco-friendly alternatives. Given this landscape, we anticipate that if an all-metal plastic-free shaving razor had more modern ease-of-use features that it would gain wider acceptance by more closely mimicking the results and experience of modern plastic razors (or possibly improving on the experience) with none of the downside of plastic waste.

The Leaf Razor was designed to address this efficacy problem for shaving. Take modern features like multiple-blades, a pivoting head, an elongated ergonomic handle; and combine that with what makes safety razors a more Earth-friendly solution (all-metal, no plastic, no proprietary blade systems). The result is a modern safety razor. This modern safety razor design could result in increased safety, decreased time of shave, increased closeness of shave, and increased satisfaction when compared with traditional safety razors and even when paired up against the current gold standard of plastic disposable razors and cartridge systems.

A multi-blade pivoting head safety razor design is intended to make shaving with safety razor blades safer by automatically maintaining the correct blade angle against the user's skin. To evaluate the efficacy of the Leaf Razor, our study addresses the following research questions:

1. Do these design features result in fewer adverse safety events when compared with a traditional safety razor?

2. Do users perceive the razor to be safer to use than a traditional safety razor?
3. Can users complete a shave faster when the razor is safer and requires less technique?
4. Will users be more satisfied overall with the closeness and quality of their shave?
5. Are users more likely to recommend a razor that has these features?

METHODS

Participant Inclusion Criteria

Eligible participants had to be located in the US (for ease of deploying this study) and could be of any gender shaving anywhere. The key screening criteria was that the participant should have no prior history or experience with using a traditional double-edge safety razor, or The Leaf Razor. Additionally, participants were screened via a questionnaire to ensure that they had regular shaving habits, were available and able to record at least 15 shave reports over a 3 month period, and were willing to fill out both the pre- and post-study data surveys.

CONSORT Diagram and Characteristics of Participants

The CONSORT diagram of the study is presented in **Figure 1**. In short, 100 applicants were deemed eligible and consented to partake in the study. Nine participants did not complete the pre-study survey following their intake acceptance. Of the 91 that participated in the pre-study survey and were randomized into Group 1 (Control Group), Group 2 (traditional double-edge safety razor, Bambaw™ brand), or Group 3 (The Leaf Razor), 11 participants removed their self from the study during the 12-week trial. Of the 11 that did not complete the study, 3 (all from Group 2) ceased participation due to safety concerns with continuing to use the traditional double-edge safety razor. The remaining 8 participants (from Group 1 and Group 3) did not meet the minimum 15 case report criteria over 12 weeks, and did not complete the post-study survey and so were excluded. Thus, a total of 80 participants (n = 27 Group 1, Control; n = 30 Group 2, Safety Razor; n = 51 Group 3, The Leaf Razor) completed the study.
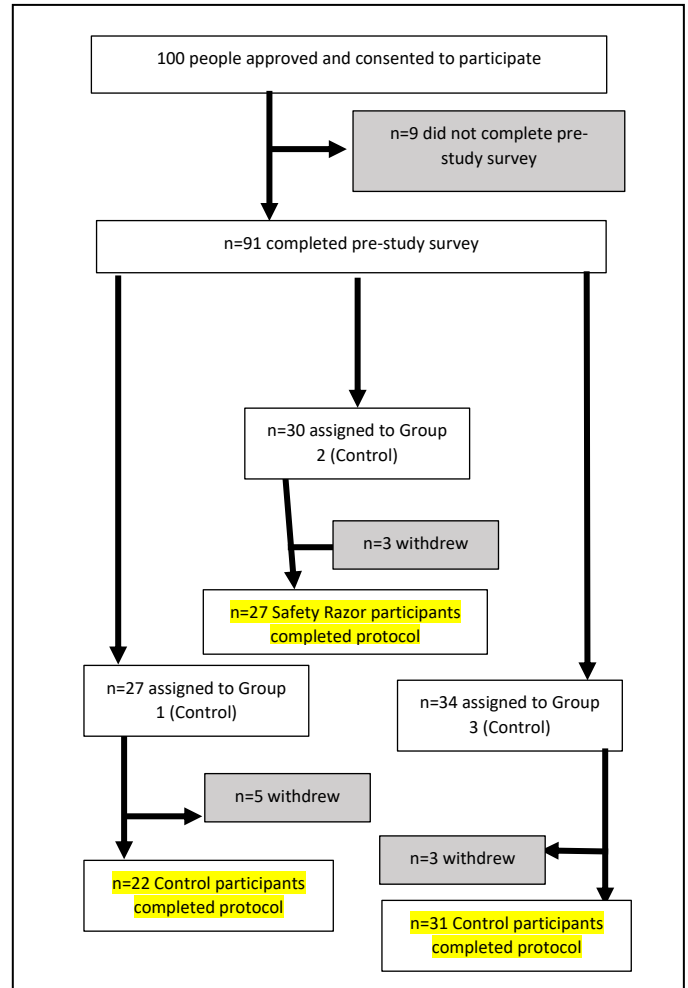

Figure 1: CONSORT Diagram. This figure illustrates the number of participants from enrollment to completion of the study.

Participant Characteristics

Participants indicated which razor they were currently shaving with prior to the study. **Table 1** shows the breakdown for each group's participants. We see a majority of participants were shaving with the popular online shave brand Billie (*New York, NY*), followed by Bic, a low-cost competitor to higher end brands Gillette and Schick, and Generic Store Brands which are white-labeled shaving systems produced by a 3rd party. Gillette brand razors (Including Venus) and DSC (Dollar Shave Club) made up the middle mix and Harry's, Schick and Bulldog brought up the rear with the lowest usage from participants in this study.

	Billie	Harry's	Gillette	DSC	Generic	Bic	Schick	Bulldog
Grp 1	10	2	3	3	4	3	1	1
Grp 2	12	0	4	5	3	6	0	0
Grp 3	17	1	4	2	2	7	1	0

Table 1: Breakdown of which brand participants were shaving with prior to the study

Analysis

Pre-Study and Post-Study Surveys were analyzed alongside the 1,505 shave reports collected using Excel.

It was possible to select more than 1 shave area during a shave, so we further reduced the shave reports to include reports where the participant only shaved their legs or shaved their legs and their underarms which was the largest overlap (and underarms were the area with the smallest singular time impact on a shave). **Table 2** illustrates the resulting number of shave reports available for exploring timing after filtering for the above criteria. We removed outliers on the time reports, where reported shave time was greater than 3 standard deviations from the mean reported time.

Statistics

Prior to data collection, sample-size calculations were performed utilizing previous shave reports from product-development research performed internally at Leaf Shave. We determined that an *n*-size of approximately 30 individuals per group would yield adequate power to detect significant differences in the key variables being measured.

Statistical analyses were performed in Excel. Select dependent variables were analyzed between groups using independent samples *t-tests*, and all other dependent variables were analyzed between groups over time using two-way repeated ANOVAs. All data in tables and figures are presented as mean ± standard deviation values, and statistical significance was set at $p < 0.05$.

PROCEDURE

Pre-Study Survey

At the beginning of the study, every participant filled out a Pre-Study Survey (**APPENDIX B**) to establish baselines of behavior. We established where they are typically shaving, what brand of razor they currently use, and asked them to rate their satisfaction, perceived safety, ease-of-use and time related to their current shave routine.

Shave Reports

Following randomization, each participant was shipped a material packet, comprised of materials required to participate in completing the full three months of shave reports.

Group 1 – Control: Our control group was asked to continue shaving with the razor setup that they are currently using.

Group 2 – Traditional Safety Razor: We provided a standard 3-piece double-edge safety razor and 50 double-edge blades which reflects more than enough blades to complete the study. We included a brief welcome sheet with instructions on how to use it as well as the original package which had links to further tips and tricks and instructions on how to use a traditional safety razor. In essence, the level of preparation that a new user would experience if they were to have made the purchase themselves.

Group 3 – Leaf Razor: We provided a Leaf Razor, which is a multi-blade pivoting head safety razor. This unique and proprietary design to Leaf Shave, LLC. We provided 100 single-edge blades which reflects more than enough blades to complete the study. We included a brief welcome sheet with instructions on how to use it as well as the original package which had links to further tips and tricks and instructions on how to shave with The Leaf Razor. In essence, this group also received the level of preparation that a new user would experience if they were to have made the purchase themselves.

After every shave, participants filled in and submitted a 9 question survey (**APPENDIX A**). The shave reports recorded where they shaved, what their experience was, their ongoing discreet impressions of the razor they're using, and more. In total, participants who finished the study protocol and had their surveys included for analysis tallied 1,505 shave reports. You can find the survey in Appendix A.

Post-Study Survey

After each participant submitted the minimum required number of shave reports, they received a Post-Study Survey (**APPENDIX C**), which was asked similar questions to the Pre-Study Survey to assess their experience and thoughts about the razor they used during the study.

Shave Reporting Compliance

Each participant was asked to submit a minimum of 15 shave reports over a 3 month period. Regarding shave report compliance, all participants who finished the study met the study minimum of 15 post-shave report submissions. Group 1 (Control Group) submitted 19.3 ± 4.6 reports. Group 2

(Traditional Safety Razor) submitted 17.4 ± 2.9 reports. And Group 3 (The Leaf Razor) submitted 17.9 ± 2.8 reports.

Time Study

We asked participants to record how many minutes their shave routine took. We broke down the self-reported shave timing across a number of different parameters, including which area the person was shaving during that particular shave report. The selectable areas were:

- Head
- Face
- Underarms
- Arms
- Torso
- Intimate Areas
- Legs
- Feet / Toes

Because of the variety of different shave areas and differing amount of relative surface area to shave between the different areas, we explored the relationship using like-areas between the groups. For the purposes of assessing time of shaving, we looked at the shave areas with the most reports, "Legs.".

We ended up with n = 299 shave reports from Group 1 (Control Group) which represents 65% of total shave reports from Group 1; n = 323 shave reports from Group 2 (Traditional Safety Razor) which represents 68% of total shave reports from Group 2; and n = 410 from Group 3 (Leaf Razor) which represents 72% of total shave reports from Group 3.

	Report Count (*n*)	Mean Time (minutes)	Standard Dev. (min.)
Group 1	299	11.9	± 10.9
Group 2	323	11.3	± 5.8
Group 3	410	7.7	± 5.0

Table 2: Number of included shave reports in the Time Analysis after filtering for criteria and outliers, as well as mean and standard deviation in minutes across reported shaves.

Net Promoter Score®

Net Promoter Score (NPS®, *Bain and Company, Boston, MA*) is a widely used market research metric that typically takes the form of a single survey question asking respondent to rate the likelihood that they would recommend the product, company or service to a friend or colleague. NPS is often held up as a gold standard customer experience metric. NPS scores are reported from the range -100 to +100, where a higher score is more desirable. Respondents provide a rating between 0 (not likely to recommend the product at all) and 10 (extremely likely) and, depending on their response, users fall into one of 3 categories to establish an NPS score.

1. **Promoters** respond with a score of 9 or 10 and are typically loyal and enthusiastic users.

2. **Passives** respond with a score of 7 or 8. They are satisfied with the product but not happy enough to be considered promoters.

3. **Detractors** respond with a score of 0 to 6. These are unhappy users who are unlikely to buy or use the product further and may even discourage others from trying the product.

RESULTS

Shave Timing

There was no statistical difference between shave times for the three groups pre-study survey results. **Table 3** compares shave time during the study between groups. A one-way ANOVA is used to determine that there is a statistically significant difference between the data between the three groups. A Tukey-Kramer Post Hoc Test was then performed to determine the difference between each pairwise combination of groups' shave times between Group 3 (The Leaf Razor) and Group 1 (Control Group) ($p < 0.001$); Group 3 (The Leaf Razor) and the Group 2 (Traditional Safety Razor) ($p < 0.001$); and Group 2 (Traditional Safety Razor) and Group 1 (Control Group) ($p = 0.386$). A statistical difference was detected only between Group 2 and Group 3; and Group 1 and Group 3. This difference was a shorter time required to complete the shave when using The Leaf Razor.

	Group 1	Group 2	Group 3	Statistics
Group 1 x Group 2	11.9 ± 10.9	11.3 ± 5.8	-	$p = 0.386$
Group 1 x Group 3	11.9 ± 10.9	-	7.7 ± 5.0	$p < 0.001$
Group 2 x Group 3	-	11.3 ± 5.8	7.7 ± 5.0	$p < 0.001$

Table 3: Statistical analysis between Shave Time as recorded from shave reports

Safety, Satisfaction

Safety and Satisfaction survey scores from participants are presented in **Table 4**. Pre-Study numbers reflect the participant's ratings for the razor that they were using prior to enrolling into the study. Post-Study numbers reflect their thoughts about the razor they were assigned during the Study period. This table shows the data between Group 2 (Traditional Safety Razor) and Gro Group 3 (The Leaf Razor). Group 1 (Control Group) recorded no difference between pre-

study and post-study results as they did not change the razor they were using when participating in the study.

A two-tail t-Test indicated no statistical difference between the Pre-Study ratings between Group 2 (Traditional Safety Razor) and Group 3 (The Leaf Razor) for both Safety and Satisfaction with their existing (pre-study) razors.

On the other hand, a two-tail t-Test indicated a statistical difference ($p < 0.001$) for both variables Safety and Satisfaction when comparing the participants ratings after when using the study razors. Data presented in the table is Mean ± Standard Deviation in the ratings.

Variable	State	Group 2 (Safety Razor)	Group 3 (Leaf razor)	Statistics
Safety (1-10)	PRE	6.9 ± 2.4	6.3 ± 2.1	$p = 0.306$
	POST	6.7 ± 2.0	9.0 ± 1.1	$p < 0.001$
Satisfaction (1-10)	PRE	6.0 ± 1.9	5.3 ± 1.9	$p = 0.171$
	POST	7.4 ± 2.0	9.3 ± 0.9	$p < 0.001$

Table 4: Data are presented as Mean +/- SD values. Pre and Post-Study participant ratings of their razors Safety and Satisfaction (Pre-study razor, vs. Post-study razor)

In addition to gathering data on the perceived safety of the razors used during the study, we gathered safety data from each shave report submitted. Participants indicated on each shave report whether there was an adverse safety event or not, defined as a nick or cut. We then had them rate the issues during the shave as Mild, Medium or Severe in order to characterize the type of adverse safety event. **Table 5** shows the breakdown of reported safety events from each of the study groups, as well as the relative severity of the event.

A Mild adverse event was described to participants as "A small nick, 1mm in size or less, that might let blood out but will not continue bleeding for more than 1 minute."

A Medium adverse event was described as "A medium-sized cut, greater than 1mm that bleeds for a few minutes but can be cared for with an adhesive bandage."

A Severe adverse event was described as "A sizeable issue, a cut, grating or slice of skin removed that requires urgent attention and wound care."

From the adverse safety event reporting, we see Group 1 (Control Group) reporting a safety event in 32.8% of their shave reports. Of those shaves that had an issue, 84.8% of them were categorized as mild, 11.3% were medium severity, and 4.0% were considered to be severe.
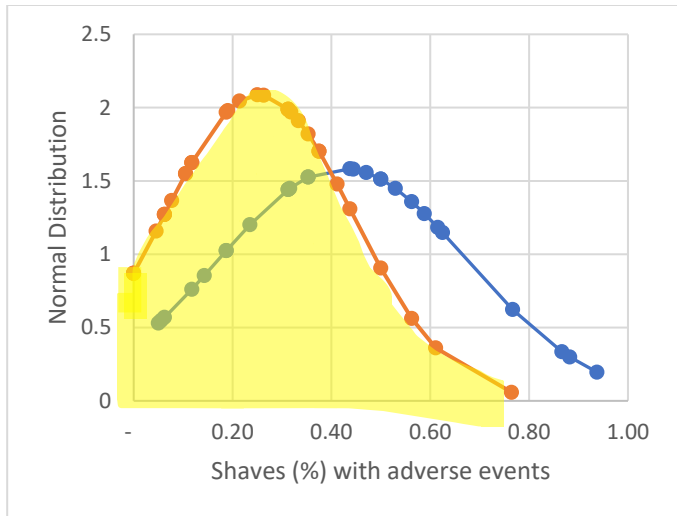
Group 2 (Traditional Safety Razor) reported the highest percentage of safety events at 46.9%. Of those shave reports that indicated an adverse event, the lowest percentage among the group's reporting was categorized as mild at 80.2%, followed by 15.8% medium, and 4.1% as severe events.

Group 3 (The Leaf Razor) reported the lowest percentage of adverse safety events throughout their shave reports (25.6%). Of those reports with safety events noted, the highest percentage of the events compared with the other two groups were considered mild (90.4%). 8.2% of the safety events were noted to be medium-level severity, and 1.4% were considered to be severe.

Closeness of Shave

One of the primary purposes of a shave is to get a close, clean-cut result safely. In addition to exploring the safety of each shave, participants reported back on the closeness of each shave and the ability to shave as close as they desired.

Participants answered two questions on the shave reports related to closeness. They first rated the closeness of their shave from 1 to 10 with 10 being perfectly smooth. **Table 6** shows the results of this shave-report question. Then they answered a binary question: whether or not they achieved their desired closeness of shave during this shave. Every participant's assessment of their experience is different, and people may be aiming for a different level of acceptable closeness in their shave, so it was important to understand whether the shave met their expectations on closeness. **Table 7** shows how many shaves were reported as achieving the desired closeness for the participant in each group.

	Total Shave Reports	Reports w/Safety Event	Mild	Med.	Severe
Grp 1	461	151 (32.8%)	128 (84.8%)	17 (11.3%)	6 (4.0%)
Grp 2	473	222 (46.9%)	178 (80.2%)	35 (15.8%)	9 (4.1%)
Grp 3	571	146 (25.6%)	132 (90.4%)	12 (8.2%)	2 (1.4%)

Table 5: Tabulation of adverse safety events as reported in the participant shave reports. Total Reports notes how many reports that group submitted in total; Reports w/Safety Events notes how many of those shaves had any sort of safety event noted

	Promoter	Neutral	Detractor	Pre-Study NPS®
Group 1	1	8	13	-55
Group 2	1	8	18	-63
Group 3	1	6	24	-74

Table 8: NPS tabulation from Pre-Study survey of participants, rating their likelihood of recommending their current razor.

	Promoter	Neutral	Detractor	Post-Study NPS®
Group 1	1	11	10	–41
Group 2	9	11	7	7
Group 3	25	5	1	77

Table 9: NPS tabulation from Post-Study survey of participants, rating their likelihood of recommending the razor used during the study.

	Mean	Standard Deviation
Group 1	6.6	± 2.4
Group 2	7.4	± 2.1
Group 3	8.7	± 1.5

Table 6: Data presented as Mean +/- Standard Deviation for the per-shave rating of closeness achieved.

	Total Shave Reports	Desired closeness achieved (# reports)
Group 1	461	214 (46%)
Group 2	473	265 (56%)
Group 3	571	491 (86%)

Table 7: Data showing the summated results of how many of the shaves submitted on shave reports achieved the participants' desired closeness (and % of shave reports per group)

Net Promoter Score®

Tables 8 & 9 show the resulting NPS scores for each group for their Pre-Study surveys (which relate to the razor they are currently using), and their Post-Study surveys which relate to the razor used during the study. After randomization we see that Pre-study NPS were relatively similar across the three groups, and also that participation in this study may have a selection bias towards people currently unsatisfied with their current shaving razor. Post-Study NPS demonstrate relatively no improvement for the control group, which is to be expected. An increase in NPS from both the traditional safety razor group, and the Leaf Razor group. The most dramatic increase came from Group 3 (The Leaf Razor). **Participants using The Leaf Razor the for the trial period who were 2.8 times as likely to be a Promoter and have a high likelihood of recommending the razor to a friend, when compared with the traditional safety razor user.**

DISCUSION

We sought to examine if a novel safety razor design that brought modern features to the table, namely a pivoting head, and multiple blades, affected the safety, satisfaction, closeness of shave, and Net Promoter Score in participants who have never been exposed to a safety razor before during a 12-week shave study period. Main findings from this study were that The Leaf Razor, the novel safety razor design, when compared with a traditional safety razor: increased safety of shaves by decreasing the number of adverse safety events, decreased time required to shave, increased satisfaction as well as ability to achieve a desired level of closeness, and increased Net Promoter Score. We also observed favorable data comparing the gold-standard of plastic razor or cartridge systems with The Leaf Razor group's results, including increased safety reporting, dramatically increased NPS and Satisfaction scores.

With a growing concern over single-use or otherwise disposable plastic consumer products, the more than 3 billion plastic razors and cartridge systems thrown away each year (in the US alone) represent significant opportunity for improvement. Traditional safety razors have been around for more than a century and represent one possible alternative to the current shaving solutions available. However, modern shavers have grown accustomed to the ease and convenience afforded by the designs of plastic razors and cartridge systems, namely that they are relatively safe, easy and fast to use. Additionally, the traditional safety razors was designed for men shaving their face. This is a small surface area, easily accessible by a shaving implement. This does not address the largest swath of modern shavers: body shavers. The challenges already presented from the fixed design of traditional safety razors are amplified when the shaver is seeking to care for much larger surface areas that are harder and more complex to reach and shave.

The hypothesis at the core of this study was that a safety razor that had more modern features could more adequately address the needs of modern shavers. And by making shaving plastic-free more accessible from an ease-of-use perspective, there could be a future where all shavers shaved plastic-free and we could eliminate the perpetually ongoing waste of billions of plastic consumer products being manufactured, sold, transported and eventually thrown in the trash. In essence: if a tool made shaving plastic-free easier, faster and safer, could we increase satisfaction when compared with traditional safety razors and the current gold standard of plastic razor systems.

When addressing the question of time, the razor study data shows a statistically significant reduction in shave time when using The Leaf Razor and comparing it to both a traditional safety razor, as well as the gold-standard plastic razor system. It is unsurprising to see a reduction in time when compared with a traditional safety razor because a pivoting-head and multiple blade design is based on increasing efficiency and speed in covering a lot of ground. What is surprising is to see average shave times lower than the gold-standard of plastic razors. One potential explanation for this, which is further supported by data around closeness of shave, is that The Leaf Razor is a more efficient shave, providing a shave that is closer than modern plastic razors, and thus requires fewer passes to achieve a desired closeness, which would result in a speedier shave.

One of the most important metrics assessed was 'safety.' Shaving razors literally present sharp blades against your skin in order to remove hair, which is a setup that is likely to cause adverse safety events (nicks, or cuts in the skin) leading to irritation or bleeding. Traditional Safety Razors are characteristically harder to use in a safe way, as they are more manual in technique. The user must work to manually maintain a stable and relatively precise angle-of-attack for the blade against the skin being shaved. Varying off of this angle results in presenting the blade against the skin in an unintended manner which can result in skin catching beneath the blade and nicks / cuts occurring. The Leaf Razor, on the other hand, integrates a modern plastic-razor feature (the pivoting head) which mechanically maintains the correct blade angle for the user regardless of what the user is doing. This provides more consistent presentation of the blade against the skin as it's shaving which in practice should reduce adverse safety events. The safety results from this study support this hypothesis by demonstrating that The Leaf Razor resulted in a 33% increase in perception of how safe the razor was when comparing that data with the reports from the traditional safety razor group ($p < 0.001$). Additionally, whereas the traditional safety razor group recorded adverse safety events in 46.9% of their shaves, only 25.6% of The Leaf Razor's shaves had adverse events recorded. And of those events, The Leaf Razor user's reported fewer medium-level events and fewer severe-level events. Most of the issues were considered minor. This is consistent with the overall perception of safety between the two razors.

What was surprising in the data, however, was that The Leaf Razor group recorded adverse safety events in fewer shaves than even the gold-standard plastic-razor control group (25.6% vs. 32.8%). And The Leaf Razor group also reported a 14% increase in overall perception of safety when compared with the gold standard control group ($p < 0.05$).

One potential explanation for this is that The Leaf Razor's multi-blade setup is more customizable than a modern plastic cartridge razor because the blades are loaded individually, which allows the user to make some adjustments to how aggressive the overall razor is to suit their needs. For example, some participants in the study reported using only 2 blades loaded into The Leaf Razor, leaving the bottom spot empty, which as the instructions noted would make the razor less aggressive. For some shavers this is a more comfortable setting, and the result may be that participants were better able to dial the razor in and avoid adverse safety events.

We expected that the plastic-free razor groups would record closer shaves than the control group, as generally speaking safety razors are capable of delivering a sharp shaving blade at increased exposure to the skin than cartridge razors are capable of. This hypothesis was supported in the data, with Group 3 (The Leaf Razor) reporting a mean closeness rating of 8.7 ± 1.5; Group 2 (Traditional Safety Razor) had a closeness rating of 7.4 ± 2.1; and Group 1 (Control Group) with a closeness rating of 6.6 ± 2.4. A one-way ANOVA was used to determine that there is a statistically significant difference between the data from the closeness rating on the shave reports between the three groups. A Tukey-Kramer Post Hoc Test was then performed to determine the difference between each pairwise combination. A statistical difference was detected between all three groups ($p < 0.05$ between Group 1 and Group 2; $p < 0.001$ between Group 1 and Group 3, and Group 2 and Group 3).

There are many factors that can lead to a user of a razor to be satisfied or not, this may include how safe it is, how close the shave is, how easy it is to use, how it looks and feels in hand, and any other myriad of factors. This study asked users to rate their satisfaction with their regular razor pre-study, then also again post-study to rate their satisfaction with the razor that was used for the 12-week period. Our hypothesis was that users would be overall more satisfied with a plastic-free razor that had the modern features of The Leaf Razor. There was no statistical difference in satisfaction of whatever razor participants were using prior to the study ($p = 0.171$). We were able to detect a difference in satisfaction between the groups using the plastic-free razors, with Group 3 (The Leaf Razor)

indicating a mean satisfaction score (from 1 to 10) of 9.3 ± 0.9, which was 25% greater than Group 2 (Traditional Safety Razor) at 7.4 ± 2.0 ($p < 0.001$). Group 1 (Control Group) indicated an overall satisfaction score of 7.0 ± 1.8 at the close of the study, which was not statistically different from their pre-study score ($p = 0.113$).

Net Promoter Score is a widely accepted measure of user satisfaction related to products or services. The pre-study NPS is the biggest indicator that participants in this study were biased to be seeking alternative solutions to their current razor, as the pre-study NPS scores for Groups 1, 2 and 3 were (respectively) -55, -63 and -74. The hypothesis was that, consistent with satisfaction scores, the more modern design features of The Leaf Razor should result in a higher NPS score when compared with users' feedback on a traditional safety razor. The data does not contradict this, with Post-Study NPS scores of 7, and 77 for groups 2 and 3 respectively. An NPS score above 20 is considered favorable, a score above 50 is considered excellent, and a score above 80 is considered world-class. It is clear that the study participants found razors that were more likely to make promoters out of the users than their existing plastic razors did. And notably, the easier, safer, faster and generally more consistently satisfying razor, The Leaf Razor, is in world-class territory.

LIMITATIONS

A limitation of these current data is that this study was performed with a population of participants who were self-selecting as interested in a razor study, and may have been predisposed to not be satisfied with their current razor and actively seeking an alternative solution. Additionally, as the study was organized and executed by Leaf Shave Company, this may have introduced bias for Group 3 to overstate their results when using The Leaf Razor, despite guidance to be objective. Another limitation is the population largely consisted of female participants, there was not enough data separating specific shave areas (face / head for example) to draw specific conclusions around shave areas.

CONCLUSIONS

This study demonstrates that the modern user-features in The Leaf Razor (pivoting head, multiple adjustable blades) was effective at decreasing adverse safety events, decreasing shave time, increasing satisfaction, increasing NPS score and increasing closeness of the shave when compared with traditional safety razors and in many cases modern plastic razors. All of these findings warrant continued investigation into how ease-of-use design features can continue to increase efficacy, safety and acceptance of plastic-free razors for shaving.

APPENDIX A – SHAVE REPORT QUESTIONS

1. Date of shave

2. Where did you shave?

    - Head

    - Face

    - Under Arm

    - Torso

    - Intimate areas

    - Legs

    - Feet / Toes

3. How many minutes did your shave take (from first swipe to last swipe)?

4. How many adverse safety events (nicks or cuts) did you experience overall during your shave?

    - 0 to 10

5. How many of the adverse safety events were mild? (A mild safety event will present as a small nick, a "weeper", less than 1mm in size, that might bleed for a minute or two but no more).

    - 0 to 10

6. How many of the adverse safety events were medium? (A medium safety event will present as a medium-sized nick or cut, a few millimeters in size, that may bleed for up to 5 minutes).

    - 0 to 10

7. How many of the adverse safety events were severe? (A severe safety event will present as a sizeable issue, a cut or slice of the skin requiring treatment or care like medication, a balm, a bandaid etc. and will take several minutes or longer to care for and subside).

    - 0 to 10

8. Where on your body did the issue(s) occur? (Specificity is important here, for example: "I got a few minor nicks on my calf," or "I experienced a severe-level cut on the back of my head, or back of my knee.")

9. How confident were you in using this razor by the end of this shave? (Did you find it easy to use, achieve a desired result, safely? This may change over time and from shave-to-shave).

    - 0 (tentative, sill learning) to 10 (I've mastered this razor)

10. How close would you rate your shave?

    - 0 (prickly / still rough) to 10 (perfectly smooth)

11. Did you achieve the closeness-of-shave that you desired?

    - Yes / No

12. Please rate how easy this shave was.

    - 0 (very challenging) to 10 (very easy)

13. How likely are you to recommend this razor to a friend after this shave?

    - 1 (extremely unlikely) to 10 (extremely likely)

14. Is there anything else of note that you'd like to report from this shave?

15.

APPENDIX B – PRE-STUDY INTAKE FORM

1. What razor brand do you currently use? (Single-choice selection)

> - Gillette; Billie; Harry's; Schick; Bic; Bulldog; Dollar Shave Club; Generic Store Brand; Other...

2. Where do you shave? (multiple choice selection)

> - Head; Face; Under Arm; Arms; Torso; Intimate Areas; Legs; Feet / Toes

3. How many times per week do you typically shave?

> - 0 to 7

4. Please rate your satisfaction level with your current razor.

> - 0 (completely unsatisfied) to 10 (completely satisfied)

5. How likely are you to recommend your current razor to a friend?

> - 1 (extremely unlikely) to 10 (extremely likely)

6. How would you rate the safety of your current razor (taking into account adverse safety events like nicks and cuts).

> - 0 (extremely unsafe) to 10 (extremely safe)

7. How long does your shave typically last, in days, before you feel you need to shave again?

> - 1; 2; 3; 4; 5; 6; 7; 8; 9; 10-20; 20+

8. How many minutes does your shave typically take (from the first swipe, to the last swipe)?

> - 1 to 5 minutes; 6 to 10 minutes; 11 to 20 minutes; 21 to 30 minutes; 31+ minutes

APPENDIX C – POST-STUDY OUTGOING FORM

1. How many times per week did you end up shaving during the course of this study?

    - 0 to 7

4. Please rate your satisfaction level with the razor that you used during the study.

    - 0 (completely unsatisfied) to 10 (completely satisfied)

5. How likely are you to recommend the razor that you used during the study to a friend?

    - 1 (extremely unlikely) to 10 (extremely likely)

6. How would you rate the safety of the razor that you used during the study (taking into account adverse safety events like nicks and cuts).

    - 0 (extremely unsafe) to 10 (extremely safe)

7. How long did your shave last during the study, in days, before you feel you need to shave again?

    - 1; 2; 3; 4; 5; 6; 7; 8; 9; 10-20; 20+

8. How many minutes did your shave typically take during the study (from the first swipe, to the last swipe)?

    - 1 to 5 minutes; 6 to 10 minutes; 11 to 20 minutes; 21 to 30 minutes; 31+ minutes

9. How did your expectations about the razor you used during the study match the reality of using the razor?

    - 0 (It was much harder and less safe, a much different experience than expected) to 10 (it was as easy, as safe, entirely as expected)

10. Any final thoughts for us, after tracking your shaves for two months?