Looking Towards The Light: An Eye-Tracking Comparison of Deceptive and Bright Patterns

MAXWELL KELEHER, Carleton University, Canada

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1 INTRODUCTION

While we might typically consider interface design in the context of improving usability and empowering users, there are cases where the interfaces are design to manipulate users. Deceptive patterns are commonly repeated and reused interface designs which exploit psychological phenomenon to manipulate users to take, or avoid, particular actions. Deceptive patterns have become a hot topic; both in research and in the law.

After a complaint filed by the Federal Trade Commission, Epic Games will pay 245 million USD to customers who were affected by deceptive patterns in Epic Games' software [4]. Additionally, Vonage Holdings Corporation payed 100 million USD in a settlement for a case about their use of deceptive patterns which included improperly obtaining consent from customers and failing to provide easy ways for customers to cancel their telephone services [3]. These deceptive patterns are beginning to be taken seriously by legal and regulatory authorities and these large monetary consequences highlight the significant negative effects these patterns can have on end-users.

Though it is clear that we need to push back against deceptive patterns, what are the best methods for doing so? Recently, designers and researchers have begun to advocate for alternative design patterns to the deceptive patterns, called bright patterns, which prioritize user agency [15, 17]. However, there is little work which investigates the usability of these bright patterns.

In this project, I set out to study the usability of bright patterns as a way to combat deceptive patterns. Additionally, I employ eye tracking as an empirical methodology for studying; eye tracking is also under used to study the impact of deceptive patterns on usability.

2 BACKGROUND

2.1 Deceptive Patterns

Firstly, I would like to provide a brief explanation of my choice to use the term deceptive pattern. Earlier work in the field refers to deceptive patterns as "dark patterns", however, the ACM's inclusive language guidelines [2] suggests avoiding

Author's address: Maxwell Keleher, Carleton University, 1125 Colonel By Drive, Ottawa, Canada, maxwellkeleher@cmail.carleton.ca.

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Pattern	Description
Visual Interference	"Using style and visual presentation to steer users to or away from certain choices." [12]
Price Comparison Prevention	"The retailer makes it hard for you to compare the price of an item with another item, so you cannot make an informed decision." [8]
False Urgency/Scarcity	"Indicating to users that limited quantities of a product are available, increasing its desirability. [12]"
Sneak Into Basket	"Adding additional products to users' shopping carts without their consent." [12]
Trick Questions	"You respond to a question, which, when glanced upon quickly appears to ask one thing, but if read carefully, asks another thing entirely." [8]

Table 1. Descriptions of the five different deceptive patterns which appear in my prototypes.

"dark pattern" as to not promote the "connection between dark equals bad/deceptive". Moreover, Harry Brignull [1], the originator of "dark pattern", has now changed to use the term "deceptive pattern".

Brignull defines deceptive patterns as "tricks used in websites and apps that make you do things that you didn't mean to, like buying or signing up for something" [1]. Mathur et al. have provided more detail about deceptive patterns by analyzing the existing definitions to create a reasonably comprehensive taxonomy of deceptive patterns [13]. They identify two overarching mechanisms by which deceptive patterns manipulate users. "Modifying the decision space" references the ways in which deceptive patterns control the interaction choices available to users. "Manipulate the information flow" refers to how deceptive patterns can hide or de-emphasize certain information to guide user choices and behaviour. While some patterns leverage one or the other mechanism, many deceptive patterns use both mechanisms to deceive users. In my deceptive pattern prototype, I will feature the five deceptive patterns present in Table 1.

Work has been done to understand the subjective effects of deceptive patterns but empirical research is less common. To study users' perceptions of deceptive patterns, Grey et al. [7] distributed an online survey and conducted a small set of follow up interviews. In the interviews, participants provide visceral descriptions of times when they felt manipulated or deceived by particular interfaces. Some described being prevented from unsubscribing from paid subscriptions services and others mentioned feeling forced to disclose personal information. While people sometimes describe these explicit sensations of being manipulated by deceptive patterns, less obvious deceptive patterns seem to be perceived less negatively by end users [10, 11]. Additionally, many users are unaware of deceptive patterns despite their prevalence [6] and awareness does not necessarily predict ability to resist the influence of deceptive patterns [5].

2.2 Bright Patterns

In Sandhaus's paper "Promoting Bright Patterns" [15], he advocates for bright patterns as a means of combating deceptive design especially in ethically ambiguous situations. Sandhause defines bright patterns as "persuasive design solutions that prioritize user goals and well-being over their desires and business objectives" and advocates for them to be promoted by policy makers.

Bright patterns are much newer than deceptive patterns; consequently there is far less published work about bright patterns especially in terms of evaluating their usability. I was able to find two studies which directly compared deceptive and bright patterns.

In their masters thesis, Troung and Dalbard [18] studied designers' ethical perceptions of deceptive and bright patterns, as well as consumers decisions to use deceptive or bright patterns. They conducted semi-structured interviews to understand designers perceptions. They found that designers attempt to adopt ethical approaches, but believe that decisions about ethics are made by those funding the project. To study consumer opinions, they constructed two prototypes, one featuring deceptive patterns and one featuring bright patterns which they used in a within subjects experiment with a follow up interview.

In a similar study, Graßl et al. [9] compared deceptive and bright patterns in cookie consent pop-ups. They found that participants chose privacy unfriendly options at similar rates in both deceptive and neutral designs. However, they found that, participants chose the privacy-friendly option, without negative impacts on perceived control, when using the bright patterns versions of their cookie consent banners.

2.3 Eye Tracking and Deceptive Patterns

There is a notable gap in the research literature with respect to studying deceptive patterns with eye tracking methodologies. I was only able to find two studies which use eye-tracking metrics to study deceptive patterns. The first is an unpublished paper which was written by Yashasvi Nagda [14] ostensibly written during her Master's in User Experience. Nagda showed participants screenshots of images which contained deceptive patterns and and analyzed the "gaze plots", "heat maps", and "ratio of fixations in dark regions". She found that more "noticable" patterns had higher fixation ratios, but that there was little to no difference in the "perceived darkness" of the patterns.

The second piece of research I found was David Schaareman's [16] Masters Thesis which set out to leverage eye tracking to understand how users interact with deceptive patterns. He had users complete two tasks in a randomized order with each task containing a deceptive and "control" interface. He studies seven types of patterns, "sneak into basket, trick question, false hierarchy, preselection, nagging, low-stock/high-demand messages, and confirmshaming", which were spread between the two tasks. In terms of eye tracking metrics, Schaareman compared time in Areas of Interest (AOI) (the element with or without the deception), and "gaze patterns" constructed from the fixations (gazes between 100 and 300 milliseconds) and saccades. He found that participants spent more time on checkout pages which used sneak into basket, trick question, and false hierarchy, and that they participants spent more time looking at the deceptive element of the page. He did not find the same effect from the other patterns. However, Schaareman found that preseletion caused users to spend less time looking at the selection choices when one was already selected. Additionally, Schaareman analysed the gaze patterns and noticed that backtracking occurred often when the trick question pattern was present.

I consider Schaareman's work more reliable than Nagda's as it went through the thesis defence process at Utrecht University whereas Nagda's work appears to be self-published on Research Gate. While Schaareman calls for eye-tracking investigations of bright patterns, to the best of my knowledge there has been no work to that effect.

2.4 Goals and Hypotheses

Overall, my goal in this study is to perform an empirical assessment of bright patterns compared to the deceptive pattern alternative. Bright patterns are an ostensibly effective strategy for diminishing the prevalence of deceptive patterns, but they they are understudied with respect to usability.

While bright patterns are, on paper, designed to improve usability and increase task efficiency, users may be more familiar or more comfortable with the unfortunately common deceptive version of the pattern. I believe that eye tracking

	P1	P2
Gender	Man	Man
Age	23	29
Tech Background	Bachelor of Computer Science	CS Grad student
10-IUIPC	58	65

Table 2. Higher 10-Internet Users' Information Privacy Concern (IUIPC) scores indicate greater privacy concern. There is a maximum 10-IUIPC score of 70 The question text is visible in Appendix B

will allow me to properly assess if bright patterns are a more usable alternative to deceptive patterns or if they might unnecessarily confuse users.

I have the following five hypotheses which relate to the five dependent variables I detail in

H1: Users will fixate on target elements in bright patterns more quickly than deceptive patterns.
H2: Users will have lower average fixations duration for bright patterns than deceptive ones.
H3: Users will complete the task more quickly with bright patterns than with deceptive patterns.
H4: Users will be more successful in completing tasks with bright patterns compared to deceptive patterns.
H5: Perceived workload for bright patterns is lower than deceptive pattern.

3 METHODS

3.1 Participants

I had 2 participants for my study who I recruited using the invitation email in November and December 2023. I report their demographic information in Table 2. Both of my participants were men and with an average age of 29 years old. They both have a university education in a technology related discipline, and an average 10-IUIPC score of 61.5.

3.2 Experiment Setup

To avoid biasing the participants against the deceptive patterns, I have not disclosed that this study will be about deceptive patterns and bright patterns in the invitation letter (Appendix D) and in the consent form (Appendix C). After my participants complete the tasks, I will debrief them about the purpose of the study and answer any of their questions.

My images, and the associated tasks, are a combination of the interfaces uses in Graßl et al.'s [9] paper comparing deceptive and bright patterns in cookie consent banners and Troung and Dalbard's thesis [18] comparing ethical perceptions of deceptive patterns and the associated bright pattern.

I have included the images from my interfaces which I will use as my stimuli in Appendix F and provide definitions of the patterns in Table 1. For each of the tasks, I will present the relevant image of the interface on which participants will find and click the target element. The fourth and final task will involve two images of interfaces to simulate a checkout process. Participants will use a 24 inch monitor with a mouse and keyboard to complete the tasks. I will use a Tobi Pro Fusion eye tracker with a 120 Hz sampling rate to collect my eye tracking data and will analyse the data with Tobi Pro Lab software.

(1) Either accept or refuse the cookies depending on your privacy preference (Figure 1 featuring visual interference pattern)

(2) Select three plain white t-shirts with the lowest price among the t-shirt selection (Figure 2 featuring price comparison prevention)
(3) Find a pair of jeans in bleach blue and add them to your shopping bag (Figure 3 featuring false urgency/scarcity)
(4) Complete the checkout process to pay for the 2 previously selected items in your shopping bag (Figure 4 featuring sneak into basket and Figure 5 featuring trick question)

3.3 Experiment Design

My study will follow a within-subjects design as each participant will be presented both the deceptive pattern and bright pattern version of the interfaces. The independent variable is the type of pattern in the interface: either deceptive or bright. My study involves five dependent variables. For eye tracking metrics, I will use time to first fixation to assess the salience of the target elements in each task as well as mean fixation duration in area of interest to understand user confusion regarding the target element. For performance metrics, I will use task completion rate to understand how deceptive and bright patterns affect efficiency, and success rate to see if deceptive or bright patterns impact participants ability to complete the tasks. Finally, I will use NASA Task Load Index (TLX) scores to assess the perceived workload and understand if the type of pattern affects task difficulty.

3.4 Experiment Procedure

I will begin each instance of the experiment by explaining the study to the participants and having them complete the consent form. Then I will introduce the participant to the eye tracking equipment and make sure that they are properly positioned and understand that they cannot move their head while performing the tasks on the computer. Next I guide the participant through the calibration for the eye tracker and have them complete a quick training task. Then the participant will complete the four tasks for one of the prototypes (see Appendix F for the images used for each task); I alternated between participants starting the bright pattern and deceptive pattern tasks. After they complete the first prototype, I will ask participants to complete the NASA Task Load Index (TLX) questionnaire for that prototype (see Appendix A for the NASA TLX questionnaire). They will then complete the tasks for the other prototype and fill out the NASA TLX questionnaire for the prototype. Finally, I have the participant complete the demographic and Internet Users' Information Privacy Concern (IUIPC) questionnaire (see Appendix B for the questionnaires) and debrief them about the fact that I was using deceptive patterns in the study.

4 RESULTS

It is important to mention some difficulties in my data collection before I describe my results from the study. When performing the first calibration with P1, there was very poor recognition of his eyes. I proceeded with the experiment, but the eye tracker captured very little gaze point data when he completed the tasks with deceptive pattern. Fortunately, I was able to collect good eye tracking data when he completed the bright pattern version of the task, but there are minimal instances where there is data from the deceptive pattern for comparison.

4.1 Eye Tracking Metrics

In Table 3, I present the average fixation duration in AOIs. For the deceptive version of the prototype, I only have eye tracking metrics for P1 from the cookie consent task. P1 had longer slightly longer average fixations on the do not agree button in the bright version of the task than the agree button in the deceptive version. It appears that P1 did not fixate on the manage options button in the deceptive version of the task, but this might just be an artifact of the

		P1		P2	
		Deceptive	Bright	Deceptive	Bright
Cookie Consent	Agree/Do Not Agree	75ms	92ms	172ms	142ms
	Manage Options	?	136ms	186ms	376ms
Shirts	3-Pack	?	0ms	297ms	247ms
	Discounted	?	83ms	375ms	252ms
Jeans	Target Jean	?	113ms	380ms	227ms
	False Urgency	?	0ms	344ms	324ms
	False Scarcity	?	115ms	243ms	199ms
Checkout	Snuck/Suggested Item	?	133ms	285ms	217ms
	Checkout	?	83ms	0ms	302ms
	Close	N/A	0ms	N/A	458ms
	Option	?	97ms	240ms	213ms

Table 3. Average fixation duration in Area of Interest (AOI) reported in milliseconds. "?" represent data which is missing due to low data capture. "N/A" indicates that the AOI was not present in that version of the task. AOIs are displayed in Appendix F

missing data. P2 had slightly longer average fixations on the agree button, but had average fixation on the manage options button in the bright version of the task which were about twice as long as those in the deceptive version of the task. For the shirts task, P2 had longer average fixations on both the products affected by the deceptive patterns in the deceptive version of the task than the bright version. P2's average fixation durations followed the same pattern in the jeans task. In the checkout task, P2 never looked at the check out section since he opted to remove the item which was snuck into his basket. P2 fixated on the snuck item slightly longer than the suggested item. P2 also had slightly longer average fixations on the deceptive version of the email subscription options than the bright version.

		P1		P2	
		Deceptive	Bright	Deceptive	Bright
Cookie Consent	Agree/Do Not Agree	464ms	1,221ms	5,318ms	21,197ms
	Manage Options	?	638ms	5,134ms	20,714ms
Shirts	3-Pack	?	Inf	559ms	397ms
	Discounted	?	3,863ms	2,584ms	6,247ms
Jeans	Target Jean	?	1,946ms	2,675ms	305ms
	False Urgency	?	Inf	717ms	2,621ms
	False Scarcity	?	2,454ms	208ms	0ms
Checkout	Snuck/Suggested Item	?	762ms	500ms	2,179ms
	Checkout	?	279ms	Inf	7,071ms
	Close	N/A	Inf	N/A	3,037ms
	Option	?	29ms	258ms	271ms

Table 4. Time to first fixation in Area of Interest (AOI) reported in milliseconds. "?" represent data which is missing due to low data capture. "Inf" indicates that the participant never focused on that AOI during the task. "N/A" indicates that the AOI was not present in that version of the task. AOIs are displayed in Appendix F

In the one case where eye tracking data was collected for P1 for both versions of the task, the cookie consent task, he took longer to look at the do not agree element than the agree element in the deceptive version of the task. There were similar results in for P2. He took longer to look at the do not agree button in the cookie consent, and took longer to look at the cheaper shirts (discounted). In the jeans task, P2 looked at the cheapest bleach blue jeans (target jeans)

faster than they did in the previous task. They also looked at the target pair of jeans before they looked at the pair of jeans which was highlighted with the false urgency pattern in the previous task. In the deceptive version of the jeans task, P2 looked at both products highlighted with deceptive patterns before looking at the target product.

4.2 Performance Metrics

	Deceptive	Bright
Cookie Consent	14,634ms	12,583ms
Shirts	6,600ms	8,217ms
Jeans	6,625ms	8,800ms
Checkout	8,242ms	9,509ms

Table 5. Average task completion time for each of the tasks in my study.

Table 5 contains the average time to complete each task. Generally, the participants took longer on average to complete bright pattern version of the tasks than the deceptive version of the tasks. The only exception was that average time to complete the cookie consent task was longer for the deceptive pattern version than the bright pattern version.

	P1		P2	
	Deceptive	Bright	Deceptive	Bright
Shirts	Fail	Fail	Fail	Success
Jeans	Fail	Fail	Fail	Success
Checkout	Fail	Success	Success	Success

Table 6. Successful of the participants for the tasks. Participants were unable to fail the cookie consent task so it has been omitted. For the shirts and jeans tasks, participants were considered successful if they clicked on the target item. For the checkout task, participants were considered successful if they avoided purchasing the extra item.

In Table 6, I present whether each participants was successful at completing each of the tasks. Notably, P2 was only successful in the bright pattern version of the check out. P2 was successful at all the bright pattern version of the tasks and was successful at both versions of the check out task.

4.3 NASA TLX

	Deceptive	Bright
Cookie Consent	20	10
Shirts	16	12.5
Jeans	8.5	7
Checkout	14.5	13

Table 7. Average NASA TLX score for each task. Higher scores indicate larger perceived workload. There is a maximum score of 35 and a minimum score of 5. Questionnaire for obtaining NASA TLX score are in Appendix A

In Table 7, I present the average NASA TLX score for each of the tasks. The scores for the deceptive pattern version of the task were higher than the bright pattern version of the tasks which indicates that the deceptive versions of the task had a higher perceived workload than the bright version of the tasks. However, the differences between the scores

for the jeans and the checkout tasks were quite small (only 1.5 points). Therefore, there seems to be minor differences in perceived cognitive workload between the deceptive and bright versions of false urgency/scarcity, sneak into basket, and the trick question patterns.

5 DISCUSSION

5.1 Hypotheses

H1: Users will have lower average fixations duration for bright patterns than deceptive ones. My results indicate that this hypothesis is mostly true. P2 generally fixated longer on the elements in the deceptive pattern version of the task than the bright pattern version. The only exceptions are that participants fixated on the manage options button in the bright pattern version of the task for far longer than the deceptive pattern version and that the fixations on the options for the trick question pattern were quite similar. So it seems that for the price comparison prevention, false urgency/scarcity, and sneak into basket, the deceptive pattern generates longer fixations on elements than the bright pattern.

H2: Users will fixate on target elements in bright patterns more quickly than deceptive patterns. My results seem to indicate that this hypothesis is mostly false. P2 took far longer to fixate on the do not agree and the manage options buttons in the bright pattern version cookie consent task, took longer to fixate on the cheaper shirt (discounted) in the bright pattern version of the task, and took longer to fixate on the suggested item in the bright version of the checkout task. The only case where the fixation of the target element was faster in the bright pattern version than the deceptive version was the jeans task. Also, the time to first fixation for the subscription options were similar on both the trick question deceptive pattern and the corresponding bright pattern. So it would seem that visual interference, price comparison prevention, and sneak into basket patterns cause larger times to first fixations in bright patterns than the deceptive patterns which they combat.

H3: Users will complete the task more quickly with bright patterns than with deceptive patterns. My results indicate that this hypothesis is false. While participants took longer to complete the deceptive cookie consent task than the bright version, the average task completion time was longer for the bright version of shirts, jeans, and checkout tasks than the respective deceptive version. This suggests that the bright patterns to combat the price comparison prevention, false urgency/scarcity, sneak into basket, and trick question deceptive patterns require users to take more time to complete tasks.

H4: Users will be more successful in completing tasks with bright patterns compared to deceptive patterns. My results indicate that this hypothesis is somewhat true. P2 was successful in all of 3 of the bright pattern version of the tasks and failed 2 of the deceptive pattern tasks. P1 succeeded at only one task which was the bright pattern version of the checkout task. Since P1 failed at most of the bright pattern tasks as well, it is hard to say that the bright patterns are always easier to complete successfully. However, the success of P2 indicates that the bright patterns made the tasks at least somewhat easier to complete successfully.

H5: Perceived workload for bright patterns is lower than deceptive pattern. My results indicate that this hypothesis is somewhat true. The participants' responses to the NASA TLX questionnaire indicate that they perceived the version of the tasks involving deceptive patterns as requiring higher workload than the version containing bright patterns. However, there are very small differences between deceptive and bright versions of the jeans and checkout tasks.

5.2 Interpretation

The fact that my results indicate that H2 and H3 are false ostensibly points to bright patterns being less usable than deceptive patterns. However, the success rate results seem to show that the short time to fixate and short task completion times are not actually an indication that the deceptive patterns are more usable. Rather, the longer fixation times and time to first fixation might indicate that the bright patterns are affording participants time to think through their actions so that they can correctly complete the tasks. The fast fixation times and task completion times for the deceptive tasks might indicate that the participants were manipulated into quickly taking an incorrect action.

My results also seem to indicate that the bright patterns were not all equally effective at improving usability. Participants took far longer to fixate on the buttons in the cookie consent task and had significantly longer fixations on the manage options button in the bright pattern version compared to the deceptive version. Therefore, participants might be more confused by the bright pattern used to combat the visual interference deceptive pattern than the deceptive pattern itself. Conversely, the bright pattern to combat the price comparison prevention deceptive pattern in the shirts task seemed to reduce confusion since there were shorter average fixations on the shirt bundle and on the discounted item. Similarly, participants had shorter fixations on the elements which were affected by false urgency/scarcity in the bright version of the task compared to the deceptive version.

In my implementation of the patterns the for tasks, both price comparison prevention and false urgency/scarcity manipulate the information flow rather than the decision space whereas visual interference pattern is manipulating the decision space as well as some manipulation of the information flow. Users approach websites with expectations about the way they will interact with the interface, and the prevalence of deceptive patterns means that many users will be basing their expectations on deceptive patterns. Consequently, bright patterns to combat deceptive patterns which manipulate the information flow may have a negative impact on usability since the interface will deviate from the users' expectations. However, bright patterns to combat deceptive patterns which manipulate the information flow will give users more accurate information which will make it easier for them to carry out their goals. Therefore, it appears that bright patterns are most appropriate to combat deceptive patterns which rely on manipulation of information flow.

Taken as a whole, the results of my pilot study offer evidence that bright patterns do not uniformly offer improvements on usability, and that the improvements are not always obvious with empirical metrics. I believe that my results show how bright patterns are better used to combat deceptive patterns which manipulate information flow vs those that manipulate the decision space.

5.3 Limitations and Future Work

This study was limited by the fact that it was a pilot study with only 2 participants. Moreover, there was significant data loss for P1's eye tracking data. However, these results still offer indications of where future studies about the usability of bright patterns should focus their efforts.

In the future, I would like to run this study with a larger and more diverse participant population. I also would be interested in using stimuli which is interactive rather than a static image. This could offer participants with more realistic interface interactions and may allow us to capture behaviours which could not be revealed with just an image. In particular, I think the check out task would benefit from interactive elements since it involved multiple screens and could force users to select one of the subscription options in second image of the task. It could also allow the checkout basket to change based on participants actions in the previous tasks.

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APPENDICES

A NASA TLX QUESTIONNAIRE

The NASA TLX is presented to participants as a 7-point likert scale

(1) How mentally demanding was the task? (very low - very high)
(2) How hurried or rushed was the pace of the task? (very low - very high)
(3) How successful were you in accomplishing what you were asked to do? (perfect - failure)
(4) How hard did you have to work to accomplish your level of performance? (very low - very high)
(5) How insecure, discouraged, irritated, stressed, and annoyed where you? (very low - very high)

B DEBRIEF QUESTIONNAIRE

Demographic questions:

(1) Which of the following best describes your gender identity? (Woman, Non-binary, Woman, Not listed (Please specify), Prefer not to say)
(2) Age in years (Numeric entry)

(3) Do you have experience in computer science, information technology, computer/software engineering, or a related field? (Yes (please briefly describe), No)

10-IUICP score with the following 7-point likert questions with "strongly disagree" and "strongly agree" on either end:

(1) Consumer online privacy is really a matter of consumers' right to exercise control and autonomy over decisions about how their information is collected, used, and shared.
(2) Consumer control of personal information lies at the heart of consumer privacy.
(3) I believe that online privacy is invaded when control is lost or unwillingly reduced as a result of a marketing transaction.
(4) It usually bothers me when online companies ask me for personal information.
(5) When online companies ask me for personal information, I sometimes think twice before providing it.
(6) It bothers me to give personal information to so many online companies.
(7) I'm concerned that online companies are collecting too much personal information about me.
(8) Companies seeking information online should disclose the way the data are collected, processed, and used.
(9) A good consumer online privacy policy should have a clear and conspicuous disclosure.
(10) It is very important to me that I am aware and knowledgeable about how my personal information will be used.

At the end of the questionnaire, I will display the following message to debrief the participants about the honest purpose of the study:

> To avoid biasing your responses to this study, I have hidden that the purpose was to compare deceptive design patterns and bright patterns. Deceptive patterns are tricks used in websites and apps that make you do things that you didn't mean to, like buying or signing up for something. Bright patterns are proposed as alternatives to the existing deceptive patterns but which prioritize user goals and freedom.
> If you are no longer comfortable participating you are still free to withdraw at this point. Do you have any questions about this study?

C CONSENT FORM

Carleton UNIVERSITY
Canada's Capital University

General Informed Consent Template for Participants

Study Title

An Empirical Assessment of Interface Friction

Name and Contact Information of Researchers:

Maxwell Keleher, Carleton University, School of Computer Science
Email: maxwellkeleher@cmail.carleton.ca

Supervisor and Contact Information:

Dr. Nadine Moacdieh, Carleton University, School of Computer Science

Email: nadine.moacdieh@carleton.ca

Carleton University Project Clearance

Clearance #: 118916

Study Clearance Date: November 2nd, 2023

Consent form version date: November 2nd, 2023

Invitation

You are invited to take part in a research project because you are an adult residing in Canada comfortable with web browsing. The information in this form is intended to help you understand what we are asking of you so that you can decide whether you agree to participate in this study. Your participation in this study is voluntary, and a decision not to participate will not be used against you in any way. As you read this form, and decide whether to participate, please ask all the questions you might have, take whatever time you need, and consult with others as you wish.

What is the purpose of the study?

There has been a significant work to understand the subjective experiences of people interacting with user interfaces containing friction, but little work which uses empirical methods. This study aims use empirical, eye tracking methods to understand the usability of interfaces containing friction.

What will I be asked to do?

If you agree to take part in the study, we will ask you to:

Complete a short lab study involving a series of tasks on a desktop computer during which I will use eye tracking equipment to track your gaze. Afterwards I will ask you to complete a short demographic questionnaire.

This study will take place in the IRIS Lab (Herzberg (HP) 5325) and your participation should take no more than 20 minutes. We will be recording the screen and your eye movements during the experiment.

Risks and Inconveniences

We do not anticipate any risks to participating in this study.

Possible Benefits

You may not receive any direct benefit from your participation in this study. Your participation may allow researchers to better understand the usability of persuasive interfaces.

Compensation/Incentives

You will not be paid or compensated for your participation in this study.

No waiver of your rights

By signing this form, you are not waiving any rights or releasing the researchers from any liability.

Withdrawing from the study

If you withdraw your consent during the course of the study, all information collected from you before your withdrawal will be discarded.

After the study, you may request that your data be removed from the study and deleted by notice given to the Principal Investigator (named above) within 2 days of your participation.

Confidentiality

We will remove all identifying information from the study data as soon as possible, which will be after your data is exported from the eye-tracking software and from Qualtrics.

We will treat your personal information as confidential, although absolute privacy cannot be guaranteed. No information that discloses your identity will be released or published without your specific consent. Research records may be accessed by the Carleton University Research Ethics Board in order to ensure continuing ethics compliance.

The results of this study may be published or presented at an academic conference or meeting, but the data will be presented so that it will not be possible to identify any participants unless you give your express consent.

We will remove all identifying information from the study data as soon as possible, which will be after your data is exported from the eye-tracking software and from Qualtrics. You will be assigned a code [or pseudonym] so that your identity will not be directly associated with the data you have provided. All data, including coded information, will be kept in a password-protected [or encrypted] file on a secure computer.

All data will be kept confidential, unless release is required by law (e.g. child abuse, harm to self or others). Your data will be stored and protected by Qualtrics, in a server located in Canada, but may be disclosed via a court order or data breach.

Version 2022-03-17

Data Retention

Your de-identified data will be retained until January 1st after which it will be destroyed.

New information during the study

In the event that any changes could affect your decision to continue participating in this study, you will be promptly informed.

Ethics review

This project was reviewed and cleared by the Carleton University Research Ethics Board [A or B]. If you have any ethical concerns with the study, please contact Carleton University Research Ethics Board (by phone at 613-520-2600 [ext. 4085 for CUREB B] or by email at ethics@carleton.ca).

Statement of consent – print and sign name

I voluntarily agree to participate in this study. ___Yes ___No

I agree to be eye tracked/video recorded. ___Yes ___No

_____ _____

Signature of participant (or parent/guardian) Date

Research team member who interacted with the participant

I have explained the study to the participant and answered any and all of their questions. The participant appeared to understand and agree. I provided a copy of the consent form to the participant for their reference.

_____ _____

Signature of researcher Date

D INVITATION EMAIL

Carleton UNIVERSITY
Canada's Capital University

Subject: Invitation to participate in an eye tracking study
Date: *To be determined*

Hello,

My name is Maxwell Keleher and I am a PhD student in the School of Computer Science at Carleton University. I am working on a class project as part of COMP 5900: Eye tracking in human-computer interaction.

I am writing to you today to invite you to participate in a pilot study entitled "An Empirical Assessment of Interface Friction". This study aims to empirically analyze the usability of friction in web design. You are eligible for this study if you are a Carleton University student above 18 years of age.

This study involves completing some short tasks on a website while having your eye movements tracked. This experiment is a minimal-risk study, meaning that it does not involve any risk beyond what is normal in daily life. You will be asked to come to HP 5325, sit at a desktop computer equipped with an eye tracker, and complete certain tasks while your eye movements are tracked. Nothing will be in contact with your body or face at any time. You will also be asked to complete a questionnaire related to your performance and preferences (you will not be asked for any sensitive information).

In addition, care will be taken to protect your identity. This will be done by keeping all responses anonymous and allowing you to request that certain responses not be included in the final project. You will have the right to end your participation in the study at any time, for any reason. If you choose to withdraw, all the information you have provided will be destroyed.

All research data will be stored on a password-protected computer in the IRIS lab (HP 5325) as well as on my personal password-protected device. Research data will only be accessible by myself and members of the class.

This research has been cleared by Carleton University Research Ethics Board B Clearance #118916.

Should you have any ethical concerns with the study, please contact the REB Chair, Carleton University Research Ethics Board-B (by phone: 613-520-2600 ext. 4085 or by email: ethics@carleton.ca). For all other questions about the study, please contact the researcher.

If you would like to participate in this research project, or have any questions about

the research, please contact me at maxwellkeleher@cmail.carleton.ca.

Sincerely,
Maxwell Keleher

E TCPS2 CORE

PANEL ON RESEARCH ETHICS
Navigating the ethics of human research

TCPS 2: CORE 2022

Certificate of Completion

This document certifies that

Maxwell Keleher

successfully completed the Course on Research Ethics based on the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2: CORE 2022)

Certificate # 0000733144 **11 June, 2022**

F SCREENSHOTS

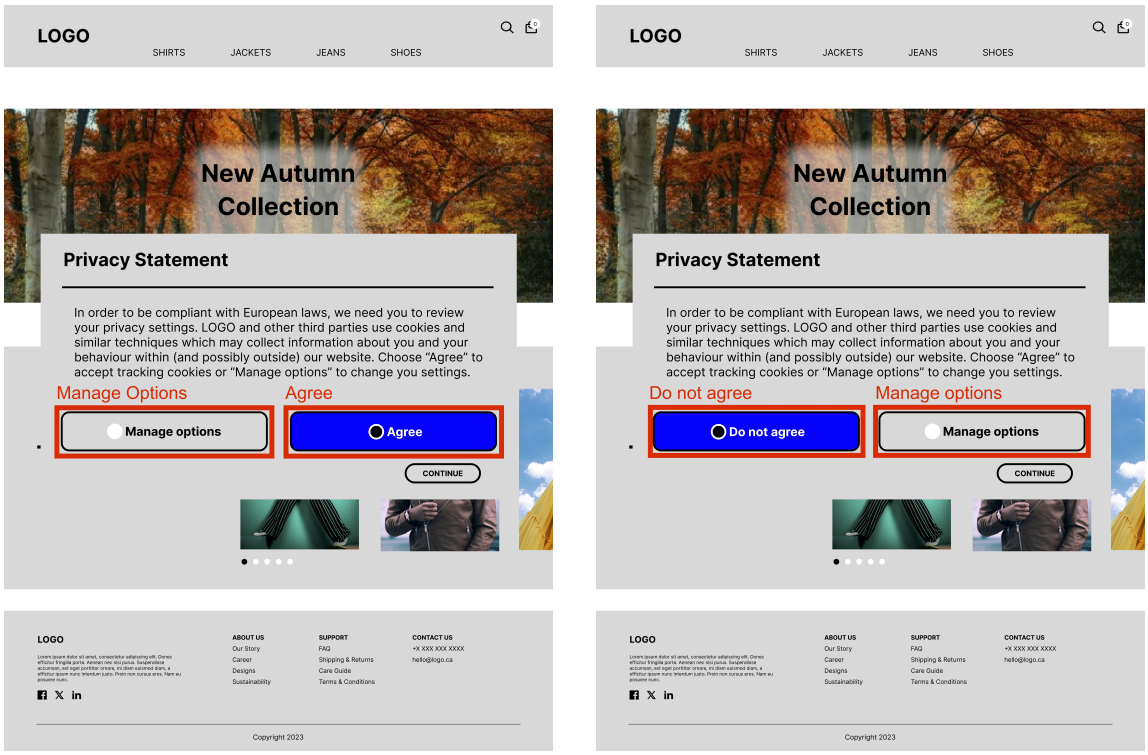

Fig. 1. Deceptive pattern (left) and bright pattern (right) version of the cookie consent popup. The deceptive pattern involved is *Visual Interference*. AOIs are highlighted in red.

G RAW DATA

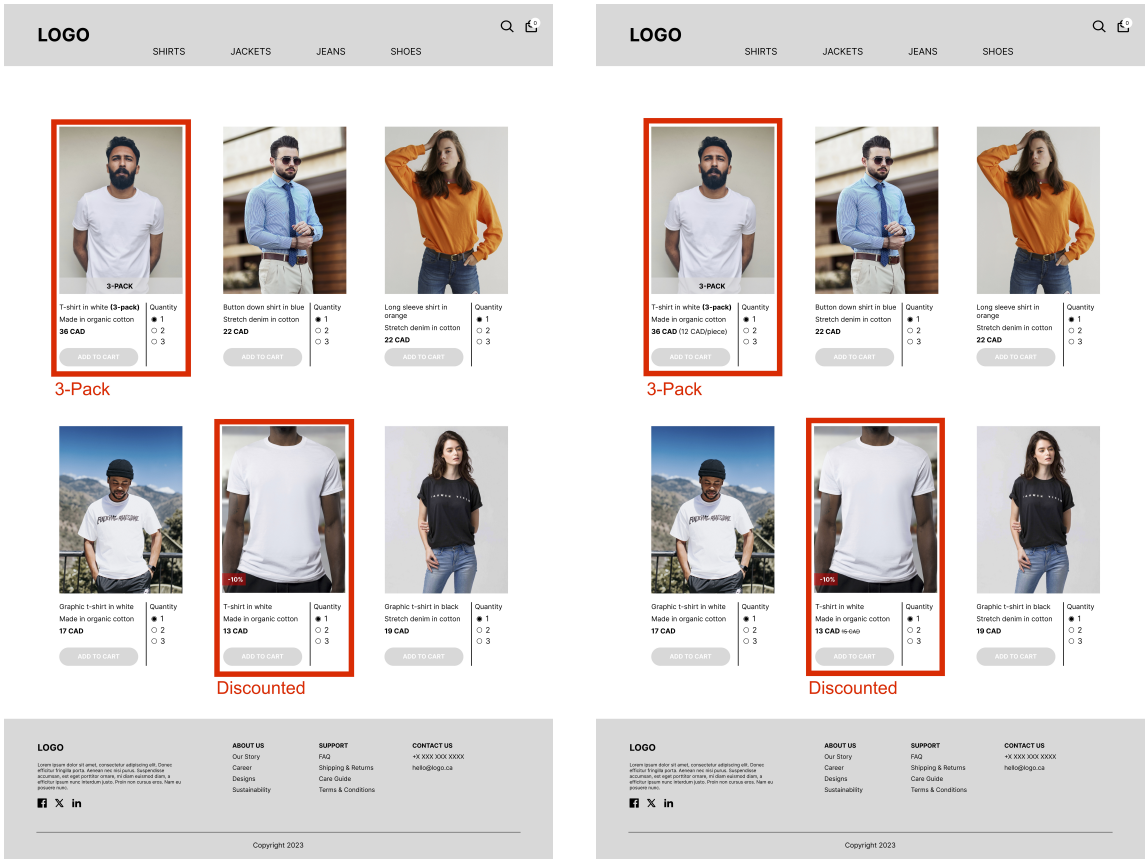

Fig. 2. Deceptive pattern (left) and bright pattern (right) version of the shirts page. The deceptive pattern involved is *Price Comparison Prevention*. AOIs are highlighted in red.

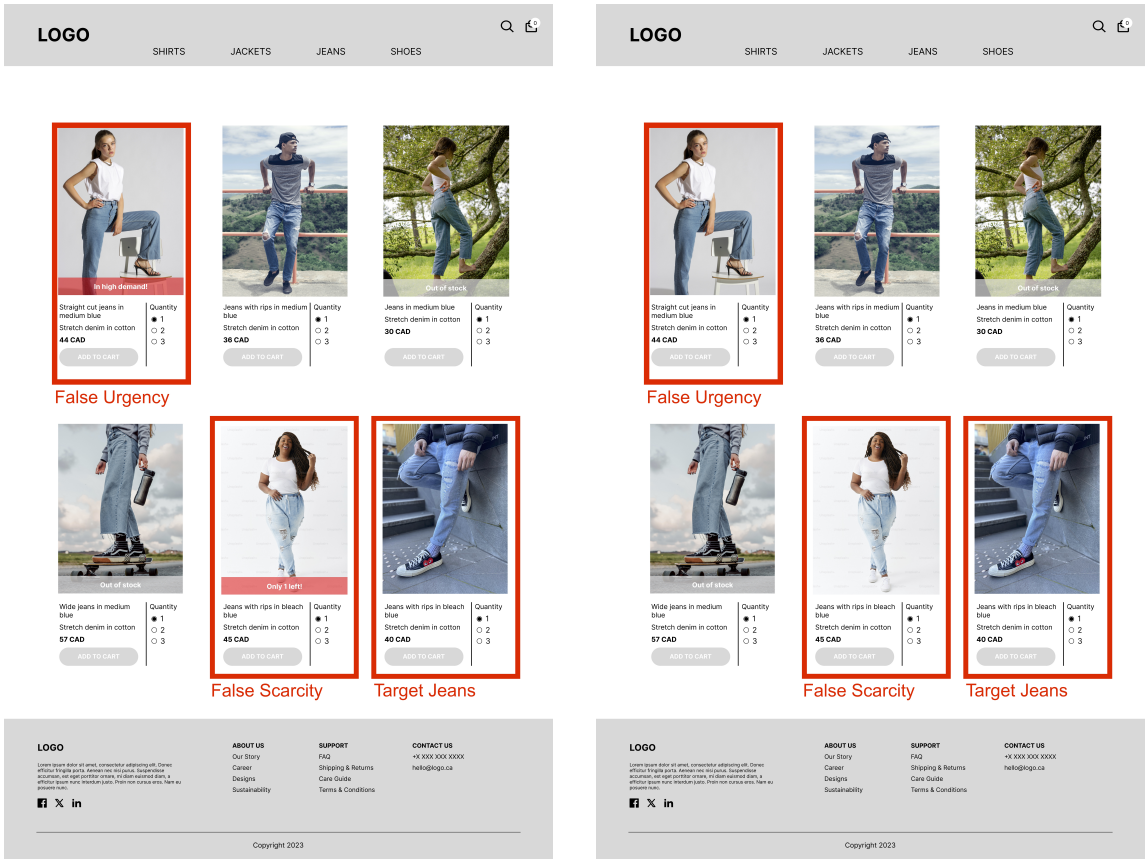

Fig. 3. Deceptive pattern (left) and bright pattern (right) version of the shirts page. The deceptive pattern involved is *False Urgency/Scarcity*. AOIs are highlighted in red.

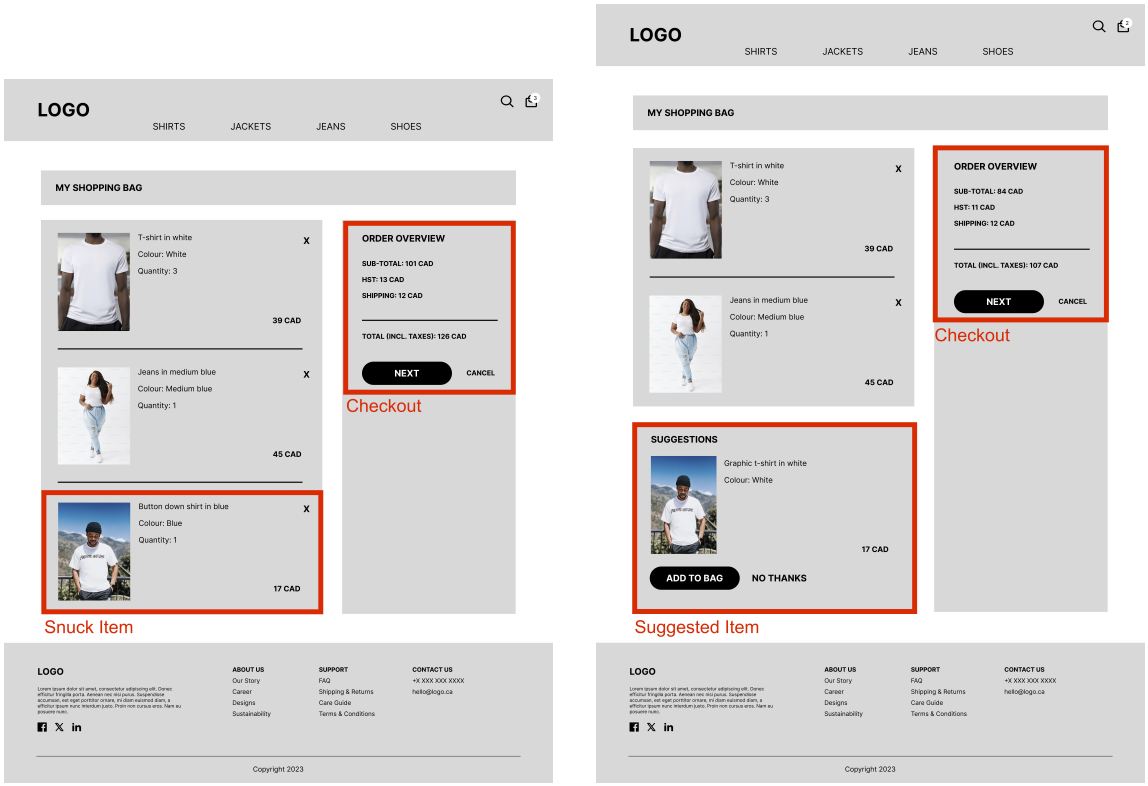

Fig. 4. Deceptive pattern (left) and bright pattern (right) version of the shirts page. The deceptive pattern involved is *Sneak Into Basket*. AOIs are highlighted in red.

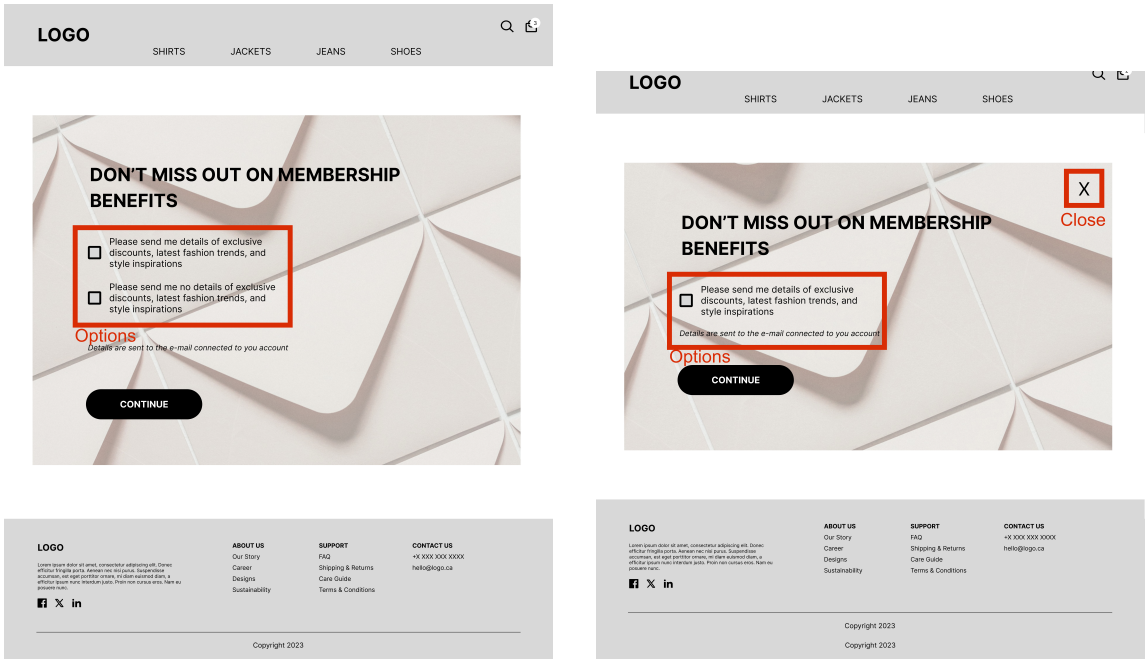

Fig. 5. Deceptive pattern (left) and bright pattern (right) version of the shirts page. The deceptive pattern involved is *Trick Question*. AOIs are highlighted in red.

		P1		P2	
Task	Question	Deceptive	Bright	Deceptive	Bright
Cookie Consent	Mental Demand	5	2	5	2
	Temporal Demand	5	2	2	1
	Performance	2	2	2	2
	Effort	5	2	4	2
	Frustration	6	3	4	1
Shirts	Mental Demand	5	3	3	1
	Temporal Demand	3	3	1	1
	Performance	3	3	1	2
	Effort	5	5	5	1
	Frustration	5	5	1	1
Jeans	Mental Demand	2	1	2	2
	Temporal Demand	2	2	1	2
	Performance	2	1	1	1
	Effort	2	2	2	1
	Frustration	2	1	1	1
Checkout	Mental Demand	1	2	6	4
	Temporal Demand	1	1	3	2
	Performance	1	2	1	1
	Effort	2	5	6	4
	Frustration	2	2	6	3

Table 8. Raw response data from both participants to the NASA TLX scale. For the Mental Demand, Temporal Demand, Effort, and Frustration questions 1 = very low and 7 = very high. For the Effort question 1 = Perfect and 7 = Failure. The question text is visible in Appendix A

		P1	P2
Demographics	Gender	Man	Man
	Age	23	29
	Tech Background	Bachelor of Computer Science	CS Grad student
10-UICIP Score	Q1	6	7
	Q2	3	5
	Q3	5	6
	Q4	7	7
	Q5	6	7
	Q6	7	7
	Q7	6	6
	Q8	6	6
	Q9	5	7
	Q10	7	7

Table 9. Raw response data from both participants to the debrief questionnaire. 1 = strongly disagree and 7 = strongly agree. The question text is visible in Appendix B