

Supplemental materials.

S1: Search engine result page example.

The figure displays two side-by-side screenshots of a Google search engine result page for the query "cruzer' flash drive 8gb".

(a) NoBlock condition: This screenshot shows a standard search result page. At the top, there is a search bar with the query "cruzer' flash drive 8gb" and a search button. Below the search bar, there are several sponsored results from Amazon.com, including "USB Memory Stick 8GB at Amazon® - Shop Computers &...". There are also organic search results from various retailers like Staples, eBay, and Walmart. The page is annotated with vertical labels on the left: "Sponsored Google shopping listings" (pointing to the Amazon results), "Top sponsored links" (pointing to the Amazon results), "Organic links" (pointing to the Staples, eBay, and Walmart results), and "Bottom sponsored links" (pointing to the bottom of the page).

(b) Block condition: This screenshot shows a search result page with a different set of results. It features a table of "Searches related to 'cruzer' flash drive 8gb" with columns for "flash drive 128gb", "flash drive 64gb", "flash drive best buy", "how to make a flash drive", "flash drive aaaa", "flash drive 1tb", "flash drive 32gb", and "flash drive target". Below the table, there is a pagination bar with numbers 1 through 10 and a "Next" button.

(a) NoBlock condition

(b) Block condition

Figure 1: Example of search engine result page for flash drive across conditions.

S2: Auxiliary experiment on computer performance

On one hand, usage of the ad-blocking extension requires additional resources (such as processing capacity, memory, and network bandwidth), which can increase Central Processing Unit (CPU) usage and thereby reduce computer performance. On the other hand, due to the reduced need to fetch and load the advertising content on a web page, ad-blocking may save some computational resources and increase computer performance. For instance, Merzdovnik et al. [2] found that blocking extensions in their study did not increase the processing capacity (while Disconnect¹ even decreased it), but increased the memory consumption. Another piece of research showed that online ads slow down the computer and ad-blockers may not be the most efficient tools in improving the loading speed due to complexity of ad-blocking script execution itself [1]. These differences may or may not be noticeable by the user.

We ran an auxiliary experiment to check whether the differences in computer performance that affected participants' satisfaction with the browsing experience were objective or just perceived. Using Selenium browser automation our script requested each URL that our participants visited during the experiment. The browser was restarted and all cookies were deleted after each product search to mimic the experimental procedure. We executed two scripts in parallel on the same two laptops (instrumented in the same way) as used during the experiment. One laptop had the ad-blockers enabled and the other did not. We measured memory usage (as a proportion of available memory), processor capacity (as a proportion of the total CPU capacity), and web page loading time. We took three measurements for each of the metrics: before the browser URL request (T1), after URL fetching (T2), and after automatic scrolling (T3), where the scripted browser scrolled to the end of the document body.

For between 36% to 41% of observations the script was not able to directly download the page. In the vast majority of cases (85.8%) the script encountered page redirects (e.g., page moved permanently or page was removed and browser was redirected to other landing page). In 11.4% of the cases the script encountered client-side errors (e.g., forbidden access to the resource or failed authorization, such as in shopping carts that require login), and in 2.7% of cases the script encountered server errors.

Based on the analysis of the remaining 59-64% of the successful requests, we found that the Block condition utilized twice as much CPU capacity as the NoBlock condition ($t(31691) = -86.88, p = 0.00$), used considerably more memory ($t(31658) = -5.1e + 02, p = 0.00$), and had longer web page loading time ($t(30533) = -22.01, p = 0.00$).

¹<https://disconnect.me/>

S3: Attitudes to advertising

Table 1: Participants' responses (in %) to the exit survey question: "Indicate how much you agree or disagree with each of the following statements?"

Online advertising...	Disagree	Neutral	Agree
... is necessary to enjoy free services on the Internet	26.88	15.57	57.55
... saves money	45.75	21.70	32.55
... saves time	47.17	20.75	32.08
... helps me find products that match my personality and interests	33.97	17.92	48.11
... helps to buy the best product for a given price	47.64	20.28	32.08
... is intrusive	15.57	17.45	66.98
... is distracting	11.79	11.32	76.89
... is disturbing	32.54	21.23	46.23
... persuades to buy the products	44.34	18.40	37.26
... is informative about the available products, their prices, or discounts	27.83	9.91	62.26
... creates brand awareness	10.85	9.43	79.72

S4: Regressions on price

Table 2: Linear mixed model regression on price_log with random individual effects.

	(1)	(2)	(3)	(4)
Block condition	-0.00388 [-0.10,0.10]		-0.00705 [-0.10,0.09]	0.000493 [-0.10,0.10]
Home computer ad-blocker user		-0.111* [-0.21,-0.01]	-0.111* [-0.21,-0.01]	-0.104* [-0.21,-0.00]
Search time				0.00736+ [-0.00,0.02]
Specific branded search query				0.0268 [-0.07,0.12]
Index of purchase-decision involvement				0.0549*** [0.03,0.08]
General online shopping frequency				0.201* [0.02,0.39]
Frequency of product purchasing				-0.0457** [-0.08,-0.02]
Durable product				-0.0525 [-0.12,0.02]
Hedonic product				0.00921 [-0.00,0.02]
No exposure to the ads of product's brand				-0.0768+ [-0.16,0.01]
Satisfaction with product quality (<i>ex-ante</i>)				0.0401** [0.01,0.07]
Constant	0.00124 [-0.07,0.07]	0.0582+ [-0.01,0.12]	0.0619 [-0.02,0.14]	-0.0489 [-0.26,0.16]
sd(Constant)	0.282*** [0.22,0.36]	0.276*** [0.22,0.35]	0.276*** [0.22,0.35]	0.293*** [0.23,0.37]
sd(Residual)	0.627*** [0.55,0.71]	0.627*** [0.55,0.71]	0.627*** [0.55,0.71]	0.620*** [0.54,0.71]
N	1650	1650	1650	1564

95% confidence intervals in brackets. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

S5: Regressions on search time

Table 3: Linear mixed model regression on search time (in minutes) with random individual effects.

	(1)	(2)	(3)	(4)
Block condition	0.192 [-0.45,0.84]		0.197 [-0.45,0.85]	0.263 [-0.24,0.76]
Home computer ad-blocker user		0.198 [-0.45,0.84]	0.203 [-0.45,0.85]	0.0268 [-0.46,0.52]
Specific branded search query				-1.217*** [-1.58,-0.86]
Order of the product searching				-0.332*** [-0.39,-0.28]
Perceived difficulty of the study				0.529*** [0.36,0.69]
Durable product				0.673*** [0.36,0.99]
Index of purchase-decision involvement				0.297*** [0.19,0.41]
Hedonic product				0.0817* [0.01,0.15]
Frequency of product purchasing				-0.0178 [-0.15,0.12]
No exposure to the ads of product's brand				0.0167 [-0.34,0.37]
Constant	4.555*** [4.11,5.00]	4.547*** [4.08,5.01]	4.445*** [3.86,5.03]	4.157*** [3.17,5.15]
sd(Constant)	2.089*** [1.71,2.55]	2.089*** [1.71,2.55]	2.087*** [1.71,2.54]	1.431** [1.10,1.86]
sd(Residual)	3.093*** [2.82,3.39]	3.093*** [2.82,3.39]	3.093*** [2.82,3.39]	2.825*** [2.56,3.12]
N	1684	1684	1684	1595

95% confidence intervals in brackets. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

S6: Regressions on satisfaction

S6.1: Satisfaction with browsing experience

Table 4: Linear fixed effect model regression on the index of overall browsing satisfaction.

	(1)	(2)	(3)	(4)
Block condition	0.0878 [-0.16,0.33]		0.0752 [-0.17,0.32]	0.0189 [-0.22,0.25]
Home computer ad-blocker user		-0.337** [-0.58,-0.09]	-0.334** [-0.58,-0.09]	-0.262* [-0.50,-0.02]
Perceived difficulty of the study				-0.107* [-0.20,-0.01]
General online shopping frequency				-0.218 [-0.64,0.20]
Internet usage skills				0.0665 [-0.21,0.34]
Chrome browser user				0.102 [-0.30,0.50]
Firefox browser user				-0.266+ [-0.57,0.04]
Internet Explorer browser user				0.156 [-0.22,0.53]
Safari browser user				-0.358* [-0.67,-0.05]
Prefer to buy online				-0.142 [-0.38,0.10]
Privacy concerns (IUIPC index)				0.109 [-0.08,0.30]
Constant	-0.0439 [-0.22,0.14]	0.181+ [-0.00,0.37]	0.142 [-0.09,0.37]	0.383 [-0.98,1.74]
N	212	212	212	212

95% confidence intervals in brackets. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

S6.2: Satisfaction with overall product choices

Table 5: Ordered logit regression on overall satisfaction with the chosen products, measured immediately after the experiment (*ex-ante*), with robust standard errors.

	(1)	(2)	(3)	(4)
Block condition	0.121 [-0.05,0.29]		0.114 [-0.06,0.28]	0.169 ⁺ [-0.02,0.35]
Home computer ad-blocker user		-0.193* [-0.36,-0.02]	-0.189* [-0.36,-0.02]	-0.131 [-0.31,0.05]
Search time				-0.00137 [-0.03,0.03]
Specific branded search query				-0.617*** [-0.89,-0.35]
Index of purchase-decision involvement				0.329*** [0.25,0.41]
Frequency of product purchasing				0.188*** [0.09,0.28]
Durable product				0.356** [0.11,0.60]
Hedonic product				0.0195 [-0.02,0.06]
No exposure to the ads of product's brand				-0.0256 [-0.24,0.19]
Satisfaction with product quality (<i>ex-ante</i>)				0.840*** [0.74,0.94]
Satisfaction with product price (<i>ex-ante</i>)				0.508*** [0.42,0.59]
N	1667	1667	1667	1595

95% confidence intervals in brackets. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Ordered logit regression on overall satisfaction with the purchased products, measured after the product delivery (*ex-post*), with robust standard errors.

	(1)	(2)	(3)	(4)
Block condition	0.0344 [-0.52,0.59]		0.0730 [-0.50,0.64]	-0.0756 [-0.67,0.52]
Home computer ad-blocker user		-0.476 [-1.07,0.12]	-0.483 [-1.09,0.13]	-0.882* [-1.56,-0.20]
Search time				0.0501+ [-0.01,0.11]
Specific branded search query				-0.368 [-1.26,0.53]
Index of purchase-decision involvement				0.160 [-0.10,0.42]
Frequency of product purchasing				0.419* [0.10,0.74]
Durable product				0.512 [-0.14,1.16]
Hedonic product				0.0575 [-0.08,0.19]
No exposure to the ads of product's brand				0.741* [0.01,1.47]
Satisfaction with product quality (<i>ex-post</i>)				0.926*** [0.56,1.29]
Satisfaction with product price (<i>ex-post</i>)				0.484*** [0.29,0.68]
N	156	156	156	149

95% confidence intervals in brackets. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

S6.3: Satisfaction with product prices

Table 7: Ordered logit regression on satisfaction with the prices of chosen products, measured immediately after the experiment (*ex-ante*), with robust standard errors.

	(1)	(2)	(3)	(4)
Block condition	0.125 [-0.04,0.29]		0.124 [-0.05,0.29]	0.159 ⁺ [-0.02,0.34]
Home computer ad-blocker user		-0.0846 [-0.26,0.09]	-0.0837 [-0.26,0.09]	-0.114 [-0.29,0.07]
Price_log				-0.527*** [-0.71,-0.34]
Search time				-0.0528*** [-0.08,-0.03]
Specific branded search query				-0.487*** [-0.75,-0.22]
Index of purchase-decision involvement				0.0959* [0.02,0.18]
Frequency of product purchasing				0.0422 [-0.05,0.13]
Durable product				0.476*** [0.23,0.72]
Hedonic product				-0.00937 [-0.05,0.03]
No exposure to the ads of product's brand				-0.0746 [-0.28,0.13]
Satisfaction with product quality (<i>ex-ante</i>)				0.618*** [0.53,0.70]
N	1667	1667	1667	1564

95% confidence intervals in brackets. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Ordered logit regression on satisfaction with the prices of purchased products, measured after the product delivery (*ex-post*), with robust standard errors.

	(1)	(2)	(3)	(4)
Block condition	0.523 ⁺ [-0.04,1.09]		0.533 ⁺ [-0.03,1.10]	0.424 [-0.18,1.02]
Home computer ad-blocker user		-0.187 [-0.76,0.39]	-0.212 [-0.79,0.37]	-0.290 [-0.88,0.30]
Price_log				-0.520 ⁺ [-1.05,0.01]
Search time				-0.0340 [-0.10,0.03]
Specific branded search query				-0.947 ⁺ [-1.90,0.00]
Index of purchase-decision involvement				0.0174 [-0.27,0.30]
Frequency of product purchasing				0.140 [-0.18,0.46]
Durable product				0.537 [-0.32,1.39]
Hedonic product				0.0321 [-0.09,0.16]
No exposure to the ads of product's brand				0.920* [0.21,1.63]
Satisfaction with product quality (<i>ex-post</i>)				0.540*** [0.28,0.80]
N	156	156	156	147

95% confidence intervals in brackets. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

S6.4: Satisfaction with product quality

Table 9: Ordered logit regression on satisfaction with the expected quality of chosen products, measured immediately after the experiment (*ex-ante*), with robust standard errors.

	(1)	(2)	(3)	(4)
Block condition	-0.00763 [-0.18,0.16]		-0.0122 [-0.18,0.16]	-0.0725 [-0.25,0.11]
Home computer ad-blocker user		-0.111 [-0.28,0.06]	-0.112 [-0.29,0.06]	-0.00471 [-0.19,0.18]
Price_log				0.266*** [0.13,0.41]
Search time				-0.00109 [-0.03,0.03]
Specific branded search query				-0.144 [-0.40,0.11]
Index of purchase-decision involvement				0.400*** [0.32,0.48]
Frequency of product purchasing				0.154*** [0.06,0.24]
Durable product				0.442*** [0.22,0.66]
Hedonic product				0.0371+ [-0.00,0.08]
No exposure to the ads of product's brand				-0.156 [-0.36,0.05]
Satisfaction with product price (<i>ex-ante</i>)				0.536*** [0.46,0.61]
N	1667	1667	1667	1564

95% confidence intervals in brackets. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10: Ordered logit regression on satisfaction with the quality of purchased products, measured after the product delivery (*ex-post*), with robust standard errors.

	(1)	(2)	(3)	(4)
Block condition	0.170 [-0.39,0.73]		0.181 [-0.38,0.75]	0.0298 [-0.66,0.72]
Home computer ad-blocker user		-0.211 [-0.79,0.37]	-0.220 [-0.80,0.36]	0.0831 [-0.54,0.71]
Price_log				0.243 [-0.31,0.80]
Search time				0.0205 [-0.05,0.09]
Specific branded search query				0.172 [-0.69,1.03]
Index of purchase-decision involvement				0.410* [0.10,0.73]
Frequency of product purchasing				0.346* [0.04,0.66]
Durable product				0.958* [0.12,1.80]
Hedonic product				0.0771 [-0.04,0.19]
No exposure to the ads of product's brand				-0.525 [-1.26,0.21]
Satisfaction with product price (<i>ex-post</i>)				0.417** [0.15,0.69]
N	156	156	156	147

95% confidence intervals in brackets. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

References

- [1] BBC News. Ad code 'slows down' browsing speeds. Accessed 17 February 2019: <https://www.bbc.com/news/technology-47252725>, 2019.
- [2] Georg Merzdovnik, Markus Huber, Damjan Buhov, Nick Nikiforakis, Sebastian Neuner, Martin Schmiedecker, and Edgar Weippl. Block me if you can: A large-scale study of tracker-blocking tools. In *IEEE European Symposium on Security and Privacy*, pages 319–333, 2017.