# TEMPORAL DYNAMICS OF CHILLING EFFECTS OF DATAVEILLANCE: EMPIRICAL FINDINGS FROM A LONGITUDINAL FIELD EXPERIMENT

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## Introduction

Everyday internet use generates vast amounts of data enabling a specific form of surveillance of individuals, i.e., digital dataveillance: "the automated, continuous, and unspecific collection, retention, and analysis of digital traces by state and corporate actors" (Büchi et al., 2022, p. 1). Individuals can experience a sense of dataveillance, i.e., feeling watched or listened to, due to triggers like news reports about dataveillance (Odermatt et al., *under review*). A possible consequence to this is a self-inhibition of individuals' legitimate digital communication behavior, including searching for (sensitive) information, voicing their opinion, and disclosing personal information online (Büchi et al., 2022). This phenomenon is known as the chilling effect of dataveillance. Empirical research on chilling effects is sparse. Studies in Switzerland relying on self-reports reveal that a majority of the population has experienced chilling effects (Latzer et al., 2023). Because chilling effects are theorized to be long-term and subtle (Büchi et al., 2022) studies should look beyond their prevalence and consider the temporal dynamics of individuals' perception of dataveillance and the resulting behavioral changes to deepen the understanding of consequences of the repeated exposure to dataveillance. Such repeated exposure over time is expected to cause an increase in a sense of dataveillance and in turn an accumulation of chilling effects (Büchi et al., 2022).

Excitation transfer theory proposes that repeated experiences can lead to emotional reactions being carried over (Cummins, 2017). The relevance of time for understanding the characteristics and consequences of emotions and their (behavioral) subcomponents is also central to studies on emotion dynamics, which focus on the fluctuation of emotions over time (Kuppens & Verduyn, 2017). For chilling effects research, this suggests that repeated triggers of a sense of dataveillance over time lead to a momentary drop in individuals' level of uninhibited digital communication behavior. This level does not perfectly recover to its initial baseline as its recovery is interrupted by a subsequent trigger. So far, studies have not captured chilling effects in-situ and over time. Hence, this paper aims to investigate how chilling effects accumulate over time by experimentally manipulating a sense of dataveillance and capturing the temporal dynamics of chilling effects.

## Method and Data Analysis

To investigate the accumulation of chilling effects over time, we conducted a six-week longitudinal online field experiment with a representative sample of Swiss internet users. Participants received 19 prompts containing notifications and news articles on different sensitive topics in areas like politics, religion, or health. For each prompt, participants were randomly assigned to either the experimental treatment, intended to heighten their sense of dataveillance, or control condition on the same topic unrelated to dataveillance. These prompts, informed by a qualitative study on triggers of a sense of dataveillance (Odermatt et al., *under review*), were successfully pretested for heightening the sense of dataveillance. Individuals who participated in 12 or more prompts were included in the sample ($N$ = 827). After each prompt, three digital communication behaviors, which were related to the topic in the article and expected to be self-inhibited due to a heightened sense of dataveillance, were measured: feeling comfortable to search for information online, voice one's opinion online, and disclose personal information. The main assumption of the study posited that the treatment prompts heighten participants' sense of dataveillance over time, leading to self-inhibition of the digital communication behaviors over time. To first inspect the temporal trends of the sense of dataveillance and the communication behaviors, we conducted preliminary descriptive data analyses. Second, to explore the relationship between the experimental condition, the sense of dataveillance, the communication behaviors, and time, we ran linear regression models. The preliminary findings of these analyses are discussed in the following section.

## Preliminary Findings and Discussion

### Sense of Dataveillance

First, the sense of dataveillance was initially rather high and increased over time ($M_{wave1}$ = 3.53, $M_{wave19}$ = 3.80; $p$ <.001). Regression analysis revealed that being in the treatment condition (vs. control) was associated with a higher sense of dataveillance, meaning that the manipulation worked as intended. Additionally, we found that the longer into the study, the higher was the participants' sense of dataveillance (Table 1). This is in line with the theoretical assumption of accumulated chilling effects over time, suggesting that the participants' residual sense of dataveillance in the experiment was carried over from previous treatment prompts (Büchi et al., 2022).

**Table 1**

*Regression Analysis for Experimental Condition and Time Predicting the Sense of Dataveillance*

| Predictor | Estimate | SE | 95% CI | | p |
|---|---|---|---|---|---|
| | | | LL | UL | |
| Intercept | 3.504 | .030 | 3.444 | 3.564 | <.001** |
| Experimental Condition [a] | .076 | .016 | .046 | .107 | <.001** |
| Time [b] | .011 | .001 | .009 | .014 | <.001** |

*Note.* Dependent variable: sense of dataveillance (1 = not at all, …, 5 = completely). Number of participants = 827, number of measurements = 14,682, total $N$ = 14,682. CI = confidence interval; *LL* = lower limit; *UL* = upper limit.
[a] 1 = control condition, 2 = treatment condition, [b] 1 = measurement wave 1, …, 19 = measurement wave 19.
*p <.05. **p <.01

### Digital Communication Behaviors

Second, over time participants felt increasingly comfortable to search for information ($M_{wave1}$ = 1.56, $M_{wave19}$ = 1.63; $p$ = .006) and voice their opinion ($M_{wave1}$ = 2.45, $M_{wave19}$ = 2.88; $p$ <.001) but felt slightly less comfortable to disclose personal information ($M_{wave1}$ = 2.45, $M_{wave19}$ = 2.88; $p$ <.001).

Regression analysis showed that being in the treatment condition (vs. control) was associated with feeling less comfortable to search for information, voice opinions, and disclose personal information (Tables 2–4). This result supports the assumption that triggers of a sense of dataveillance can lead to self-inhibition of such behaviors. Time significantly predicted a decrease in feeling comfortable to disclose information. This result can be understood as an accumulation of chilling effects over time, meaning that participants' baseline of the behavior did not perfectly recover between treatment prompts (Büchi et al., 2022). However, time had the opposite effect on feeling comfortable to voice opinions as it significantly predicted an increase in the behavior. This increase may be partially explained by the recovery potential of chilling effects suggesting that after a trigger of a sense of dataveillance, participants' baseline of uninhibited opinion voicing rather quickly reapproached the initial baseline due to a recovery phase (Preibusch, 2015). Time showed no effect on information search.

**Table 2**

*Regression Analysis for Experimental Condition and Time Predicting Feeling Comfortable to Search for Information*

| Predictor | Estimate | SE | 95% CI | | p |
|---|---|---|---|---|---|
| | | | LL | UL | |
| Intercept | 1.672 | .017 | 1.639 | 1.706 | <.001** |
| Experimental Condition [a] | -.031 | .009 | -.049 | -.014 | <.001** |
| Time [b] | -.0004 | .001 | -.002 | .001 | .576 |

*Note.* Dependent variable: feeling comfortable to search for information (1 = not comfortable, 2 = comfortable). Number of participants = 827, number of measurements = 14,682, total *N* = 14,682. CI = confidence interval; *LL* = lower limit; *UL* = upper limit.
[a] 1 = control condition, 2 = treatment condition, [b] 1 = measurement wave 1, …, 19 = measurement wave 19.
*p <.05. **p <.01

**Table 3**

*Regression Analysis for Experimental Condition and Time Predicting Feeling Comfortable to Voice One's Opinion*

| Predictor | Estimate | SE | 95% CI | | p |
|---|---|---|---|---|---|
| | | | LL | UL | |
| Intercept | 3.018 | .047 | 2.927 | 3.11 | <.001** |
| Experimental Condition [a] | -.188 | .024 | -.235 | -.141 | <.001** |
| Time [b] | .013 | .002 | -.009 | .017 | <.001** |

*Note.* Dependent variable: feeling comfortable to voice one's opinion (1 = not at all, …, 5 = completely). Number of participants = 827, number of measurements = 14,682, total *N* = 14,682. CI = confidence interval; *LL* = lower limit; *UL* = upper limit.
[a] 1 = control condition, 2 = treatment condition, [b] 1 = measurement wave 1, …, 19 = measurement wave 19.
*p <.05. **p <.01

**Table 4**

*Regression Analysis for Experimental Condition and Time Predicting Feeling Comfortable to Disclose Personal Information*

| Predictor | Estimate | SE | 95% CI | | p |
|---|---|---|---|---|---|
| | | | LL | UL | |
| Intercept | 1.970 | .009 | 1.953 | 1.987 | <.001** |
| Experimental Condition [a] | -.011 | .004 | -.020 | -.002 | .012* |
| Time [b] | -.001 | .0003 | -.002 | -.0002 | .015* |

*Note.* Dependent variable: feeling comfortable to disclose personal information (1 = not comfortable, 2 = comfortable). Number of participants = 827, number of measurements = 14,682, total *N* = 14,682. CI = confidence interval; *LL* = lower limit; *UL* = upper limit.
[a] 1 = control condition, 2 = treatment condition, [b] 1 = measurement wave 1, …, 19 = measurement wave 19.
*p <.05. **p <.01

More in-depth insights into the accumulation of chilling effects over time require further analytical steps: To analyze the relationships of the treatment condition, the sense of dataveillance, the digital communication behaviors, and time, we plan to employ multilevel linear models which account for the nested structure of the data and disentangle between-person and within-person effects. The models will control for theoretically deduced individual characteristics of participants expected to affect chilling effects on the individual level which were collected in a survey at the end of the experiment, including personality traits, exposure to dataveillance-related information in everyday life, and sociodemographic characteristics.


**Contribution and Conclusion**
This article empirically explores how repeated confrontation with the topic of dataveillance over time leads to an increased sense of dataveillance and in turn a change in self-inhibition in information disclosing and opinion voicing. Hence, this study contributes to the growing research on the chilling effects of dataveillance which is of societal relevance as chilling effects undermine a vital role of digital communication in democratic societies by deterring people from using the internet for everyday activities, personal growth, and political advocacy (Büchi et al., 2022). Because chilling effects are conceptualized as long-term, the experimental method of this study addresses challenges of previous cross-sectional chilling effects studies to validly capture the effects (Büchi et al., 2022): The longitudinal experimental measurement captures the sense of dataveillance and self-inhibition of digital communication behaviors in-situ. This allows for insights into the prevalence, magnitude, and temporal dynamics of long-term chilling effects, rendering the findings more valid for real-life contexts. The findings can inform research on chilling effects as consequences of perceived dataveillance practices as well as assessments of the need for and appropriate design of governance interventions of dataveillance practices.

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