

1 **Make My Privacy Senses Tingle – Co-Designing Visceral Privacy Cues With**  
2 **Vulnerable Groups**  
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6 Traditional click-based consent mechanisms place high cognitive demands on users and often exclude vulnerable groups from  
7 meaningful privacy decisions - an issue intensified in AI-driven systems. We explore how visceral notice mechanisms can move beyond  
8 text-heavy disclosures to support more accessible and empowering privacy mechanisms. In 12 co-design workshops, children and  
9 people with cognitive disabilities created privacy cues through story-completion activities and evaluated multimodal notice prototypes.  
10 Participants preferred hybrid cues combining pictorial, textual, and auditory elements to enhance clarity and salience. Familiar  
11 analogies (e.g., a camera shutter sound) supported comprehension but were context-dependent, while psychologically evocative cues  
12 (e.g., a pair of eyes) increased engagement yet sometimes introduced ambiguity. We argue that rethinking consent requires shifting  
13 from purely informational approaches toward experience-based, emotionally resonant, and contextually grounded mechanisms that  
14 reduce cognitive burden while preserving agency. We propose hybrid designs that support information, control, and autonomy,  
15 contributing to broader discussions on moving beyond the click paradigm in privacy design.  
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18 CCS Concepts: • Security and privacy → Social aspects of security and privacy; • Human-centered computing → Empirical  
19 studies in HCI; • Social and professional topics → Children; People with disabilities.  
20

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22

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26

27 **1 Introduction**  
28

29 The value of user data has been rapidly increasing. Companies often use manipulative design elements, such as dark  
30 patterns [7], nudging people towards decisions against their best interest, such as encouraging them to accept all instead  
31 of only functional cookies. These practices are particularly problematic for vulnerable groups, such as people with  
32 cognitive disabilities (CD) and children. These groups not only strongly use media [1][12], he heightened abstractness  
33 of vertical data flows [9] additionally exploits the existing vulnerabilities of those whose strength lies in processing  
34 tangible information.  
35

36 Many approaches have been trying to empower individuals in their fight against vertical privacy risks by making  
37 threats more visible, such as browser extensions promoting privacy awareness [4] and therefore aiming at increasing  
38 transparency. However, such approaches often fail to restore the tangibility of offline privacy experiences, such as the  
39 physical sensation of being looked over the shoulder [2]. This tangibility also lies at the core of [3] approach of visceral  
40 notices, which aim at invoking intuitiveness through awareness instead of information. This can happen through  
41 familiarity, in which a cue from a different context (e.g., Zoom’s record sound or the blinking dot of an analog camera)  
42 is applied in a new situation (e.g., on an eye-tracking screen) but still triggers the initial reaction (e.g., becoming aware  
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of a recording in progress; [11]). A second way is warning through psychological reaction. Here, innate reactions to certain cues are leveraged, such as a pair of eyes signaling being watched and reactively limiting one's self-disclosure (e.g., [6]). While several studies have acknowledged the potential of visceral cues in designing privacy notices, no studies to date have investigated this concept among vulnerable groups. For people with CD and children, this could mean leveraging their information processing strengths through intuitive, tangible cues, a direction that has already been deemed fruitful in tangibility research [5]. Furthermore, such notices could increase autonomy for these groups who otherwise often rely on caregivers or parents [8][10].

We conducted 12 co-creation workshops (five with individuals with CD, N = 24; seven with primary school children, N = 35) in which the participants designed their own privacy cues based on a story completion task and evaluated four visceral notice demonstrators provided by the researchers. These differed in modality (auditory vs visual) and type of visceral cue (familiarity vs psychological reaction). They were embedded in short videos, in which a user chose to accept instead of reject all cookies. Upon that decision, a visceral notice was presented: a record sign (visual + familiar), a pair of eyes (visual + psychologically evocative), a camera shutter sound (auditory + familiar), and a voice whispering "I can see what you're doing" (auditory + psychologically evocative). We found that visceral privacy cues can serve as a promising design material for creating tangible consent interventions.

## 2 Findings From Our Co-Design Workshops and Implications for Designing Visceral Cues

We found that participants favored multimodal privacy cues, combining visual and auditory elements to enhance salience, while additional textual explanations were seen as essential for clarity. The evaluation of the four visceral prototypes brought by the researchers revealed systematic trade-offs between salience, clarity and emotional impact of visceral cues. Familiar cues (record sign and shutter sound) were criticized to have less impact on behavioral changes or lack in clarity, particularly without context. However, if chosen well, they could foster ease of understanding. Psychologically evocative cues (eyes and whispering), on the other hand, caught more attention and increased emotional engagement but were criticized as ambiguous or evoking uncomfortable emotional responses. Across all groups, one visceral cue alone was reported to be insufficient. Additional cues were proposed to enhance the proposed cues, in particular adding a textual warning. Furthermore, participants consistently requested additional information alongside visceral cues and that visceral cues be paired with actionable control, reversibility (e.g., "back" or undo options), and customization across modalities (e.g., text-to-speech or accessible language).

Overall, the opinion prevailed that visceral cues should be designed as multimodal rather than single, isolated warning signals. Visual cues, including textual and pictorial elements, were favored for the clarity and salience they provided to the warnings. This was identified as a significant drawback of audible cues, as single sounds could be misinterpreted or unclear. Although haptic notices were mentioned least frequently, they were valued for their accessibility for users with visual or hearing impairments. In particular, combinations of visual and auditory elements were favored. Participants explained that the main advantage of multimodal approaches is that they support inclusiveness and diverse needs. A read-aloud function was often seen as particularly crucial, as was making warning sounds clearer by adding text. These findings suggest that visceral cues are most effective when they balance multimodal, attention-grabbing qualities with interpretability, which reinforces the need to design accessible, comprehensible and adaptable visceral consent cues.

## 3 Contributions to the Workshop

Our contribution to the workshop lies in advancing an empirically grounded reframing of visceral consent cues in the context of vulnerable user groups. Drawing on co-design workshops with children and adults with CD, we contribute a

perspective that goes beyond assessing whether visceral cues are noticed or preferred, and instead examine how such cues are interpreted, negotiated, and integrated into users' sense-making and decision processes.

A central contribution of our work is the shift from understanding visceral cues as single awareness mechanisms toward treating them as design material within participatory and ethical consent design. Our findings suggest that visceral cues do not work independently but derive their meaning and effect from how they are integrated into broader systems of information and control. This challenges the assumption that affective salience alone can support informed or autonomous consent, particularly in contexts where users rely strongly on tangibility and intuitive processing. We examine both the potentials and limitations of visceral cues, highlighting pros and cons of attention-grabbing or emotionally reactive designs: While such cues can influence the acceptance and make abstract data practices perceptible, they may also introduce ambiguity, discomfort, or misinterpretation if not sufficiently contextualized. This becomes especially pronounced for vulnerable user groups. Furthermore, we identify trade-offs (or rather questions) in visceral cue design, such as between salience and interpretability, provocation and user comfort, and awareness and actionable control. Our findings support hybrid consent designs, in which visceral cues are combined with information, opportunities for user intervention, and mechanisms for revising decisions. Finally, we extend current debates on data control by emphasizing autonomy as a design outcome. Our findings suggest that autonomy in consent situations is relational and negotiated, particularly where caregiver involvement plays a role. By highlighting the importance of customization, choice, and flexibility, we contribute empirically grounded insights into how visceral cues can support autonomy without the risk of manipulation or paternalism.

Taken together, our contribution offers an evidence-based perspective on how visceral cues can be rethought as design material for consent interfaces - not only for vulnerable user groups but for everyone. This perspective can be relevant not only for cookie banners, but also for other consent contexts such as app permissions, platform settings, and data-driven services.

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