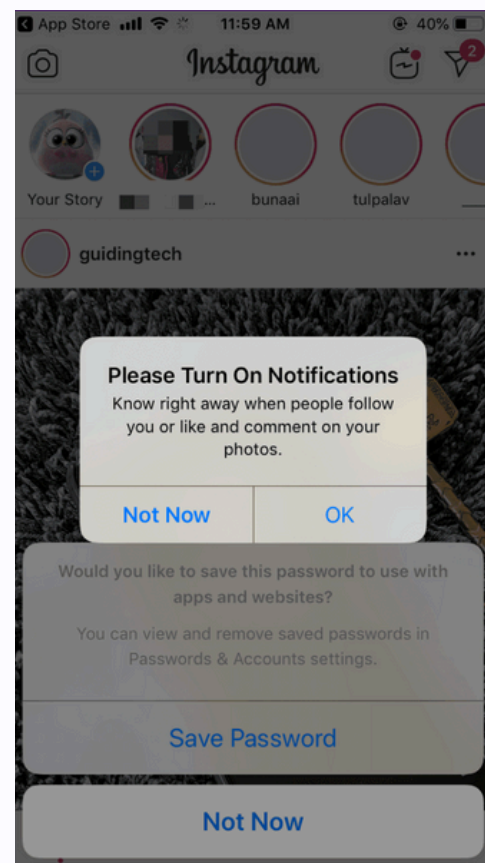


Deceptive Design Patterns on Health Applications

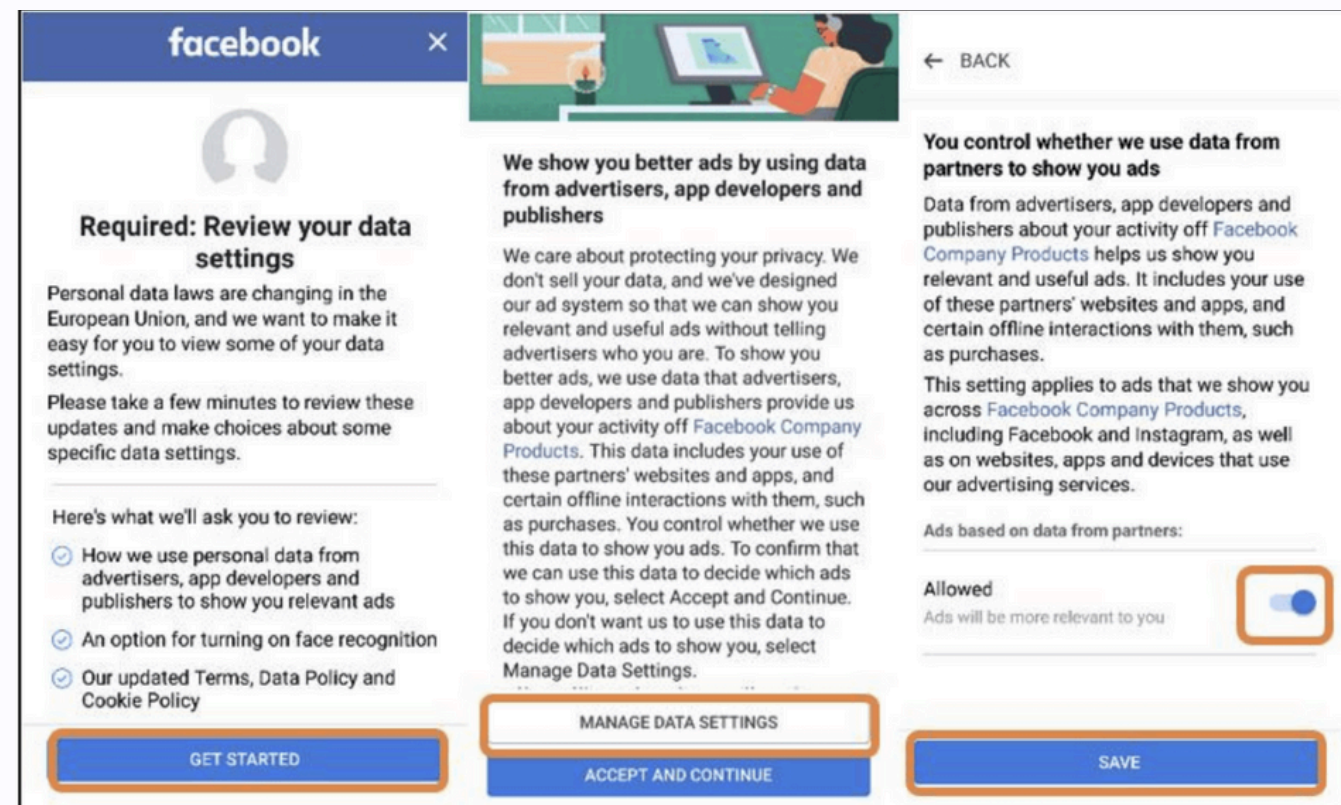
Efthalia Liouta, Nikolaos Avouris
University of Patras

Deceptive Design Patterns



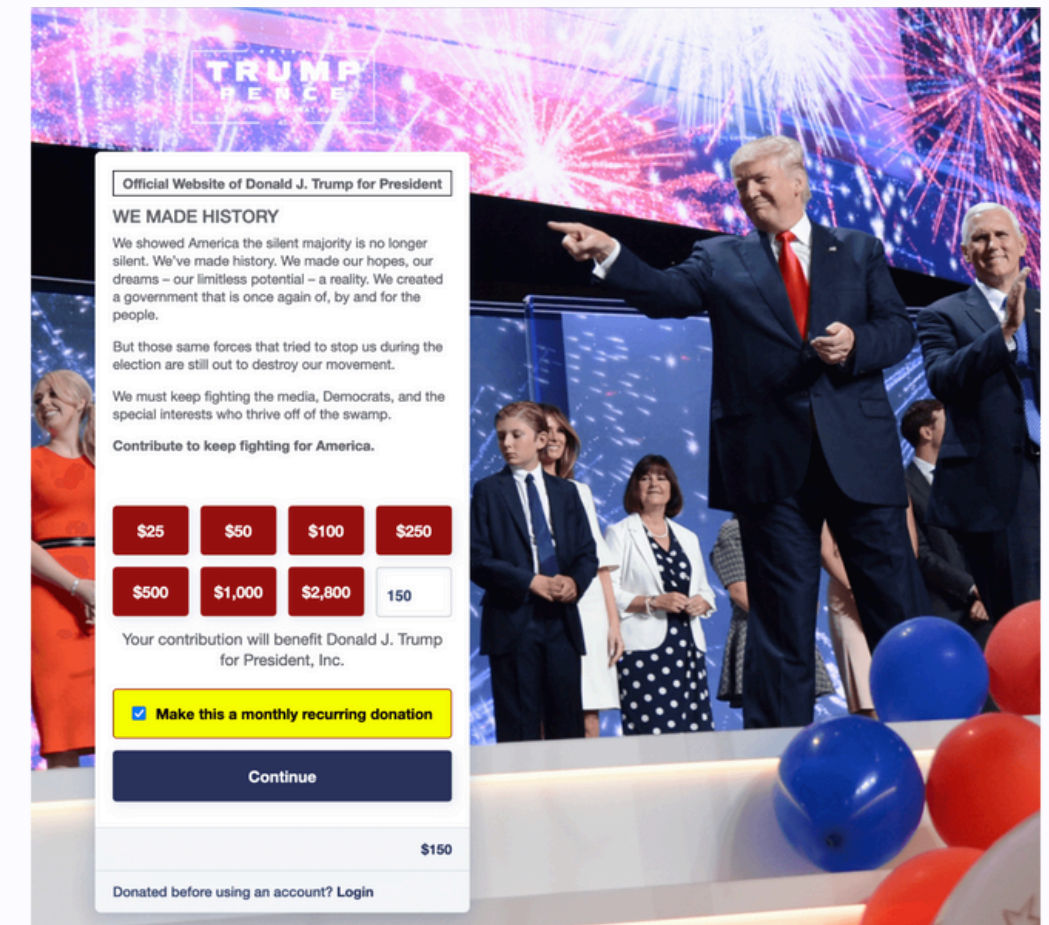
Nagging

interrupts the user with a request to do something



Obstruction

creates obstacles or roadblocks in the user's path



Preselection

pre-ticked checkbox, putting items in the user's shopping cart, or pre-selecting items in a series of steps

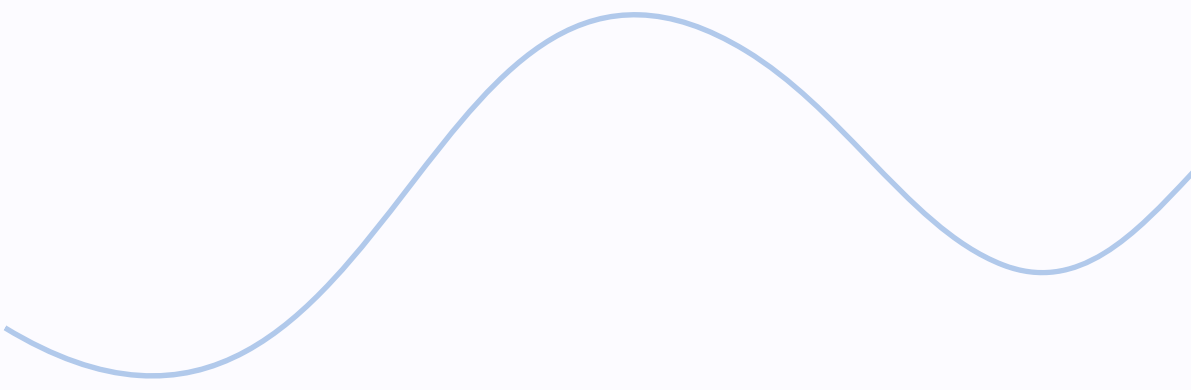


Research Questions



RQ1: To what extent do representative health-related applications contain deceptive design patterns?

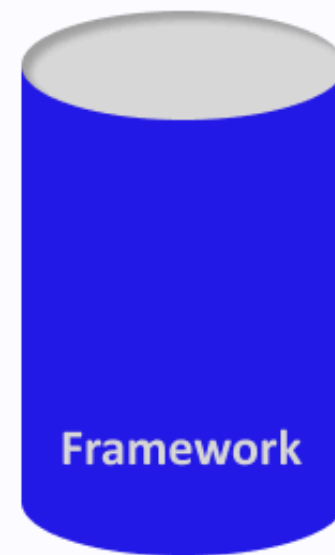
RQ2: How useful and understandable is the proposed evaluation framework for identifying and assessing deceptive design patterns in health-related applications?



Review of literature,
taxonomies, laws,
existing frameworks

Initial Draft

25 Yes/No Questions



Final

Evaluations



Pre-Evaluation

Measurability
Understandability
Importance



Pitot Evaluation +
Inter-Rater Validation

2nd Evaluator

Questions were **rephrased** and refined.
Adopted a **Likert scale** instead of binary answers to reflect complexity + **Rules**

Framework applied to the Flo App

The second evaluator repeated the assessment.
Calculated Inter-Rater Reliability (ICC = 0.83)

Use of Deceptive Patterns (Forced Action)

1. Does the app force users to sign up, share data, or upgrade before allowing access to basic features?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ This question refers to situations where users can't explore or use the app without first providing personal info, subscribing, or upgrading.

-- If yes, place here the explanation and proof --

Use of Deceptive Patterns (Forced Action)

2. Does the user have to provide personal health data to use basic features?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ Sometimes, users must input

-- If yes, place here the explanation and proof --

Clarity in Design

9. Does the app introduce unnecessary steps or interruptions that complicate completing a routine task ?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ Basic actions are interrupted by steps that serve no functional purpose. For example when loading data it is needed to see a promotion in order to proceed.

-- If yes, place here the explanation and proof --

Use of Deceptive Patterns (Preselection)

3. Are any choices or permissions default?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ Default-checked boxes take a ticked boxes for consent or mark

-- If yes, place here the explanation and proof --

Use of Deceptive Patterns (Preselection)

4. Is it unclear whether these selections?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ When the application does in Permissions are grouped under v you can deny or change them.

-- If yes, place here the explanation and proof --

Use of Deceptive Patterns (Nagging)

5. Does the app repeatedly message or prompt ?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ Persistent messages that app

-- If yes, place here the explanation and proof --

Use of Deceptive Patterns (Nagging)

6. Does the app display disruptive moments to put action ?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ e.g., too many buttons, ads,

-- If yes, place here the explanation and proof --

Use of Deceptive Patterns (Obstruction)

7. Is it difficult to cancel, or screen or action ?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ Users struggle to find or use i

-- If yes, place here the explanation and proof --

Use of Deceptive Patterns (Obstruction)

8. Does the interface visually favor one option over others ?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ Design draws attention to a preferred action using color, size, or highlighted while "Reject" is hidden)?

-- If yes, place here the explanation and proof --

Clarity in Design

9. Does the app introduce unnecessary steps or interruptions that complicate completing a routine task ?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ Basic actions are interrupted by steps that serve no functional purpose. For example when loading data it is needed to see a promotion in order to proceed.

-- If yes, place here the explanation and proof --

Clarity in Design

10. Are the workflows de or illogical way that make to predict the next step or confidently, causing hesita task abandonment?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ The app does not follow stan

-- If yes, place here the explanation and proof --

Clarity in Design

11. Are buttons or actions or misleading way?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ Call to action labels don't ma

-- If yes, place here the explanation and proof --

Clarity in Design

12. Is the screen visually obscures the main action?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ e.g., too many buttons, ads,

-- If yes, place here the explanation and proof --

Clarity in Design

13. Are important documents understand ?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ Legal documents (e.g., terms under multiple screens.

-- If yes, place here the explanation and proof --

Clarity in Design

14. Does the app use urgency or fear-based messages ?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ Language incites fear or rushes the user to act. (e.g., "Act now or risk your health")

-- If yes, place here the explanation and proof --

Clarity in Design

15. Are notifications urgency ?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ Push notifications c

-- If yes, place here the explanation and proof --

Clarity in Design

16. Do prompts or attempts to shame acting using guilt ?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ Push notifications c monitored your blood p

-- If yes, place here the explanation and proof --

Data and Cookie Transparency

20. Is it unclear what personal data is being collected and for what purpose?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ The app collects data without explaining its use.

-- If yes, place here the explanation and proof --

Data and Cookie Transparency

21. Are reasons for collecting this data written in simple, non-legal language ?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ Users can't understand the privacy policy.

-- If yes, place here the explanation and proof --

Data and Cookie Transparency

22. Are users not given a clear and equal choice to accept or reject data permissions or cookies ?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ Users can accept all in one tap, but declining takes multiple steps. Or in case of rejecting some they are unable to use the app.

-- If yes, place here the explanation and proof --

Data and Cookie Transparency

23. Is it not transparent whether the app shares data with third parties?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ The user is unaware if or how their data is monetized. (e.g., advertisers, insurers)

-- If yes, place here the explanation and proof --

Data and Cookie Transparency

24. Are options to decline consent less visible, less accessible, or more difficult to interact with than the "Accept" option ?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ e.g. "Reject" is a plain text link while "Accept" is a bright button.

-- If yes, place here the explanation and proof --

Data and Cookie Transparency

25. Is it difficult or impossible to change privacy or data-sharing settings after onboarding ?

No / Not applicable

Slightly

Moderately

Strongly

Extremely

ⓘ Users cannot easily find or modify their data preferences. (e.g. You must email support to opt out of data sharing rather than toggling a setting in the app).

-- If yes, place here the explanation and proof --

Score	Label	UX Impact	Concerns
1	Not at all / Not applicable	Not present	No ethical concern
2	Slightly	Rare, doesn't alter flow	Ethically safe
3	Moderately	Noticeable, creates hesitation	Raises ethical questions
4	Strongly	Repeated and persuasive	Undermines autonomy
5	Extremely	Pervasive, manipulative	Emotionally/legally dangerous

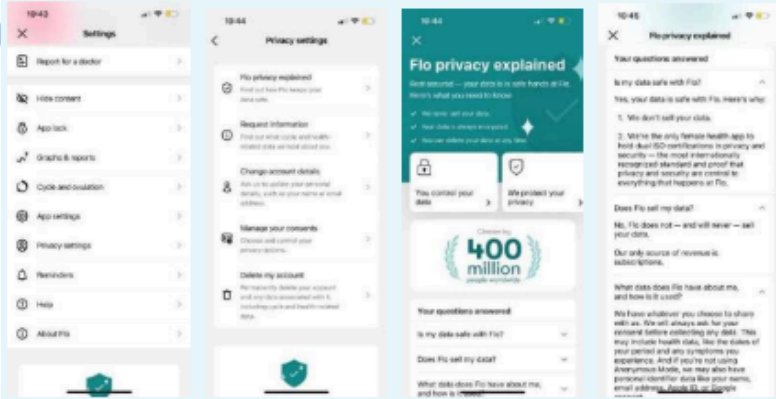
Normalized Score =
$$\frac{\text{Answer's Score}-1}{4}$$

Final Score =
$$\frac{\text{Total Score}}{N}$$

N is the number of the framework's questions.

Index (0-1)	Interpretation
0.00 – 0.25	Low – Minimal or no deceptive patterns present. Ethical design observed.
0.26 – 0.50	Moderate – Some problematic elements present; design may affect clarity or autonomy.
0.51 – 0.75	High – Significant presence of deceptive patterns, user manipulation likely.
0.76 – 1.00	Critical – Pervasive and harmful design choices; serious ethical concerns.

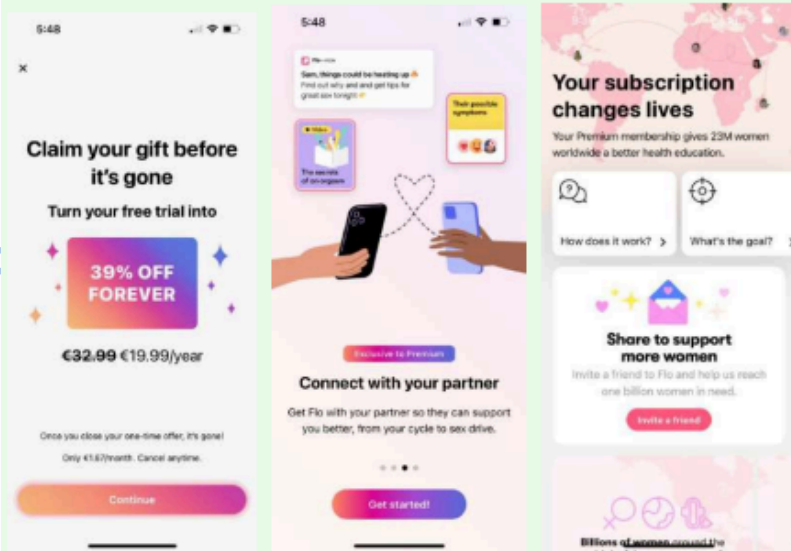
Terms and conditions are hidden under collapsible menus and hard to understand



Language and Tone

14. Does the app use urgency or fear-based messages ?

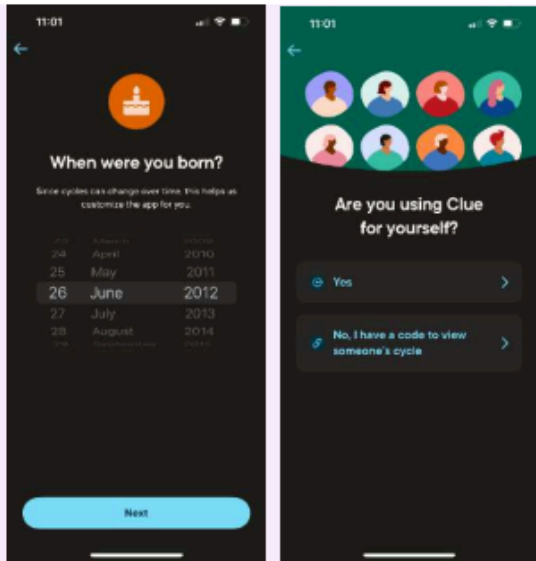
① Language incites fear or rushes the user to act. (e.g., "Act now or risk your health")



Language and Tone

15. Are notifications designed to create panic or urgency ?

① Push notifications or in-app notifications pressure users using alarming phrasing.

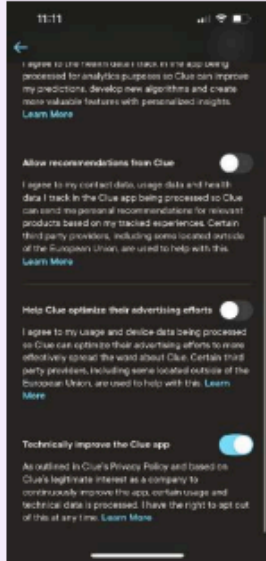


Use of Deceptive Patterns (Preselection)

3. Are any choices or permissions preselected by default?

① Default-checked boxes take advantage of user inattention. Users must actively uncheck to opt out (e.g., ticked boxes for consent or marketing).

Only some of the options



-- If yes, place here the explanation and proof --

Language and Tone

15. Are notifications designed to create panic or urgency ?

① Push notifications or in-app notifications pressure users using alarming phrasing.

-- If yes, place here the explanation and proof --

Language and Tone

16. Do prompts or messages use language that attempts to shame, or pressure the user into acting using guilt ?

① Push notifications or in-app notifications pressure users using alarming phrasing. (e.g. "You haven't monitored your blood pressure today - Are you neglecting your health?")

-- If yes, place here the explanation and proof --

Language and Tone

17. Do messages suggest negative outcomes if the user does not act immediately ?

① Threats of consequences unless the user takes instant action. (e.g. "Without this upgrade, your data could be lost!")

-- If yes, place here the explanation and proof --

Language and Tone

18. Are suggestions or recommendations presented as mandatory actions ?

① Optional actions are framed as required.

-- If yes, place here the explanation and proof --

Language and Tone

19. Do any error messages in the app blame the user or imply personal failure in a way that could trigger guilt or anxiety, particularly in relation to health data or actions ?

① System failures or skipped actions are framed as user faults.

-- If yes, place here the explanation and proof --

Data and Cookie Transparency

20. Is it unclear what personal data is being collected and for what purpose ?

① The app collects data without explaining its use.

Use of Deceptive Patterns (Preselection)

Is it unclear that the user has control over these selections?

① When the application does not make it obvious that users can change their preferences. For example, permissions are grouped under vague headings like "optimize experience," with no clear indication that you can deny or change them.

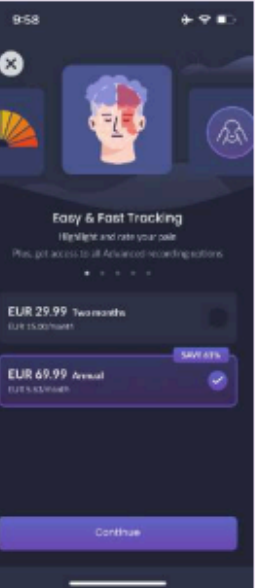
The annual plan is visually emphasized.

Use of Deceptive Patterns (Nagging)

Does the app repeatedly show the same message or prompt ?

① Persistent messages that appear frequently (e.g., push to upgrade, allow tracking) .

Multiple screens urge upgrades "Take control today!", "Experience MBplus", and the MBplus card is persistent in the main feed.



Use of Deceptive Patterns (Nagging)

Does the app display reminders at strategically disruptive moments to push the user toward an action ?

① During important user action, for example during task completion or exist .

Upgrade prompts are shown during the migraine attack tracking flow

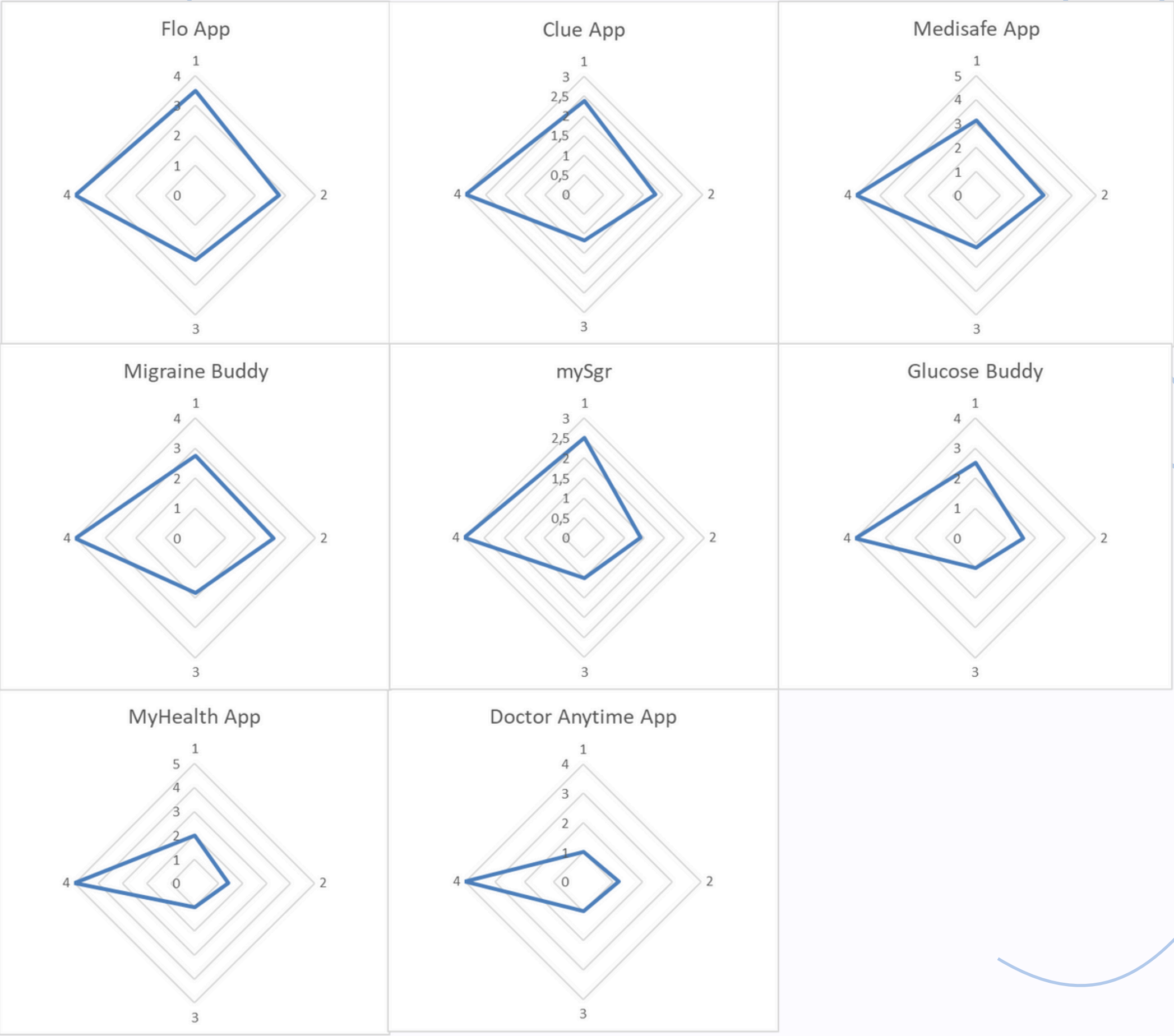
Use of Deceptive Patterns

Clarity In Design

Language and Tone

Data and Cookie Transparency

Q#	Flo	Clue	My Health	Doctor Anytime	Medi safe	Migraine Buddy	My Sugr	Glucose Buddy
1	4	3	5	1	3	4	4	4
2	4	3	5	1	3	3	4	4
3	2	2	1	1	2	2	3	2
4	3	2	1	1	2	2	2	2
5	4	2	1	1	4	3	2	2
6	3	2	1	1	4	3	2	2
7	4	2	1	1	3	2	1	1
8	4	3	1	1	4	3	2	3
9	3	2	2	2	3	3	2	2
10	2	1	1	1	2	3	1	1
11	2	1	1	1	2	2	1	1
12	3	2	1	1	3	2	1	2
13	4	3	2	1	4	3	2	2
14	3	1	1	1	3	2	1	1
15	2	1	1	1	2	2	1	1
16	2	1	1	1	2	2	1	1
17	2	1	1	1	2	2	1	1
18	3	2	1	1	3	2	1	1
19	1	1	1	1	1	1	1	1
20	4	3	5	4	5	4	3	4
21	4	3	5	4	5	4	3	4
22	4	3	5	4	5	4	3	4
23	4	3	5	4	5	4	3	4
24	4	3	5	4	5	4	3	4
25	4	3	5	4	5	4	3	4



Discussion & Interpretation

- Apps relying on **data monetization** (Flo, Medisafe) **scored highest**.
- Even **public apps** (MyHealth) showed **major transparency issues**.
- **B2B platforms** (Doctoranytime) had **fewer** manipulative patterns.
- The line between persuasion and deception is often blurred.

All representative apps contained some level of deceptive design **(RQ1)**.

The framework was effective and reliable, and usable **(RQ2)**, but further validation is needed.



**Thank
You**