Framing effects on willingness to participate in geolocation-based research.

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Introduction

New data types

The advent of the internet, especially mobile internet, and recent technological developments have enabled researchers to capture new data.
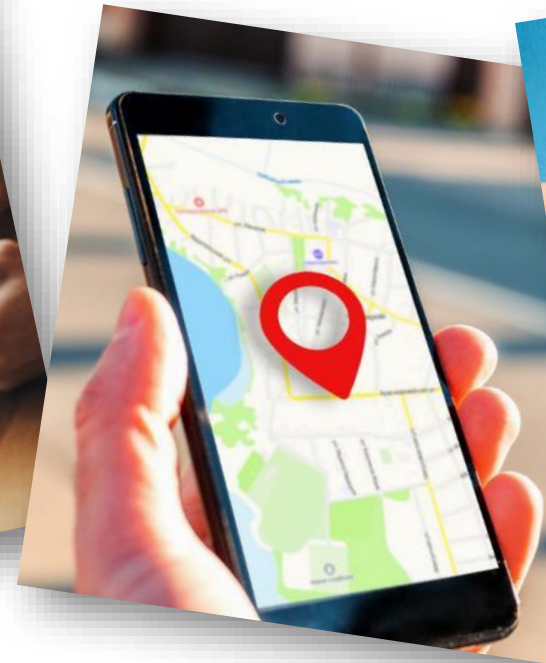

Picture/Videos

Audio recordings

Online behaviors ("metered" data)

Geolocation data

Biometric data

The Web Data Opp project
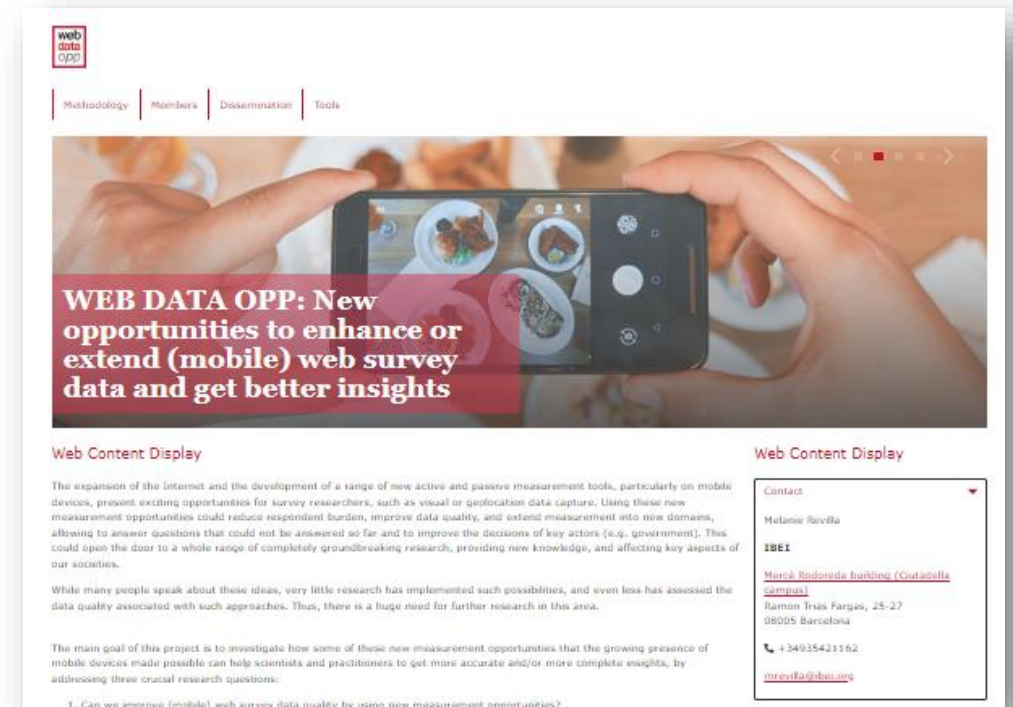
Main goal = to investigate how some of these new measurement opportunities can help scientists and practitioners to get more accurate and/or more complete insights, by addressing three crucial research questions.

Can we...

1. ... **improve data quality**?

2. ... **replace survey data**?

3. ... achieve **new insights**?

www.upf.edu/web/webdataopp

Many practical applications (examples)

web data opp

Online behaviors
- Fake news consumption (e.g., Guess et al. 2020)
- Time spent online (e.g., Festic et al. 2021)

Visual data
- Mosquitoes presence (e.g., Mosquito Alert project).
- Plants diseases (e.g., Kaur et al. 2019)

Geolocation data
- Travelling (e.g., Lin & Hsu 2014)
- Spatial context of physical activity (e.g., Krenn et al., 2011)

Voice recordings
- Level of literacy (ask respondents to read loud some text)
- Survey children's of panelists
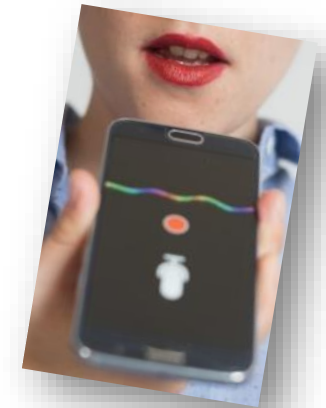
Participation, a limiting factor

The existing studies that asked samples of individuals to share such data found a large variation in the actual participation levels. For instance...

Images
$10.2\%_{[1]} \leftrightarrow 62.5\%_{[2]}$

Geolocation
$30.0\%_{[3]} \leftrightarrow 69.5\%_{[4]}$

[1] Jäckle et al., 2019; [2] Bosch et al., 2019
[3]Scherpenzeel, 2017; [4]Elevelt et al., 2017

Actual participation vs Willingness to participate

Actual participation (whether an individual actually shares his/her data) is the final result of several factors.

| Is the individual willing to participate? | ··· | Does the individual the required skills? | Technical issues? | Actual participation |

- **A key factor,** sometimes measured through (online) surveys asking about hypothetical data sharing activities ("would you agree to participate...").
- Great variability both **across and within different data types, e.g.:**
  - 17.7%[1] ↔ 65.0%[2] for images
  - 19.0%[3] ↔ 50.0%[3] for geolocation data

[1] Struminskaya et al., 2021 [2] Wenz et al., 2019 [3] Revilla et al., 2016.

Why measuring the willingness in a particular project?

Questions that must be answered before launching a project:

1. Can we reach the **minimum amount of data** required to answer our research questions?

2. What are the **specific conditions participants must be offered** to achieve the required level of participation? (e.g., data collection duration, incentives)

3. Are **different population groups willing to participate differently**? (compensate sample composition)

4. How should **we choose among different alternatives** available (e.g., surveys vs. geolocation data)?

web data opp

Does the way we describe and ask matter?

Researchers usually provide a summarized **description** of the activity before asking individuals whether they are willing to participate, that can **emphasize different aspects** (steps to follow, potential benefits, drawbacks...)

Research question: "Does the way in which the activity is described and the wording of the question asking individuals to share data have a significant impact on their willingness to participate?"

Goals and hypotheses

Goals

To investigate the effect of using different ...

(1) **descriptions of the activities** and

(2) **question wordings**

... on the willingness to participate in two hypothetical **geolocation-based research** activities.

Emphasizing some aspects of the activities is expected to produce a limited but significant **framing effect**.

Framing effect

"A cognitive bias wherein ᴀɴ individual's choice from a set of options is influenced more by the presentation than the substance of the pertinent information (Plous, 1993)".

Other examples…

• Health: Positive outcomes of exercise vs. negative consequences of a sedentary lifestyle *(Latimer et al., 2010)*

• Politics: Candidate's qualifications vs. opponent's lack of qualifications *(Shiv and Fedorikhin, 1999)*

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Emphasized aspects

We emphasized 2 different aspects of the activities (+ a "neutral" group).

NEED FOR COMMITMENT

- Individuals tend to answer "yes" when answering survey questions ("yes saying").
→ Overestimation of their willingness to participate.
- Emphasizing commitment could help mitigating this bias.

DATA SAFETY

- Safety concerns (privacy) = key reason for non-participation in data sharing.
- Adding safety assurances in the description is a natural reaction of researchers to those concern, trying to increase the willingness.

Hypotheses

H1. The "commitment" group will show **lower willingness** compared to the "neutral" group.

Encouraging respondents to state their willingness only if they were sure they would participate, we expect that respondents will be more reluctant to select positive response options = estimates closer to the actual participation.

H2. The "safety" group will show **lower willingness** compared to the "neutral" group.

Despite the description shown to this group aimed to anticipate potential safety concerns and encourage participation, past research suggests that insisting on safety assurances may lead participants to perceive geolocation-based activities as risky, ultimately decreasing their willingness.

The activities: geolocation-based research

GEOLOCATION DATA ARE...

GREAT...

Individuals' locations collected at a frequency and level of precision inconceivable using surveys.

- Reduced burden.
- Increased accuracy.

Applications:

- Identify individuals' locations and travel patterns [1]
- Detect individuals accessing pre-specified locations [2].

[1] Geurs, Veenstra and Thomas, 2013)
[2] Clemens and Ginnis, 2017

... BUT NOT PERFECT

ERRORS

Limited precision of the technologies used to geolocate devices (e.g., GPS).

- Example: wrong coordinates, undetected visit to a location of interest.

MISSING DATA

Subjective information cannot be observed using a passive tracker.

- Example: motivation of a travel, satisfaction with the mode of transport.

In-the-moment surveys

Sending a survey (to members of an online panel) right in the moment a location of interest is visited:

1. Add missing information.

2. Clarify doubtful information.

3. <u>Reduce the memory errors</u> that conventional surveys suffer from.
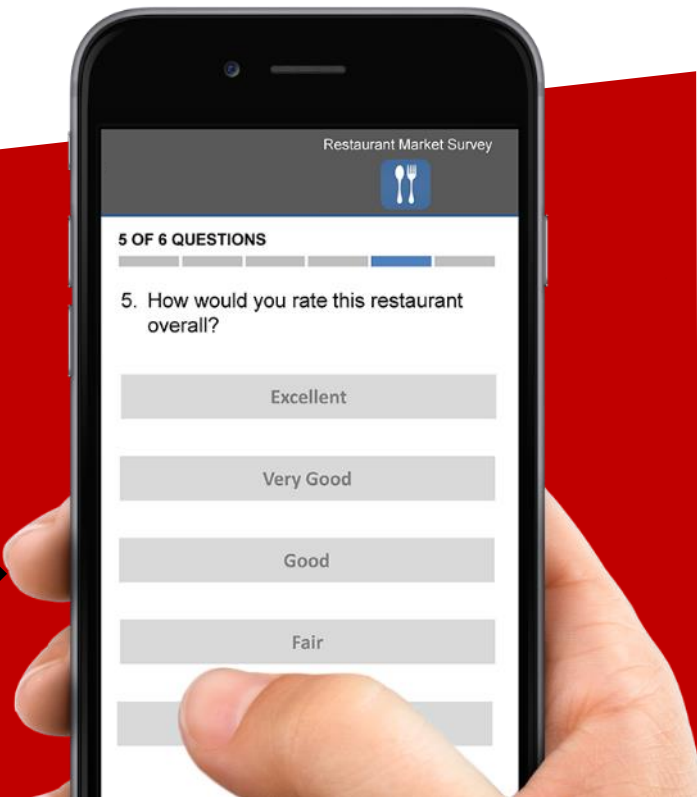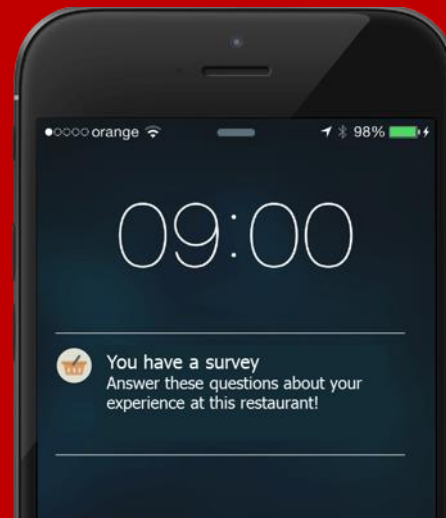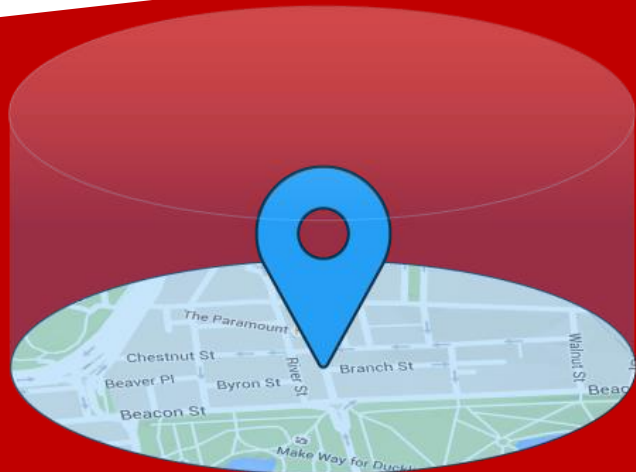
Willingness to participate in 2 different activities

Sharing geolocation data

- Already studied under different conditions. Willingness: 20% - 50%.
- Differences among participants not always consistent across studies.
- Little literature about the effect of the conditions offered to participants.

Contribution:

- Effect of project duration and incentives using a Conjoint analysis.
- More scenarios than previous literature.

In-the-moment surveys triggered by geolocation data

- A few actual experiences reported.
- No previous research on willingness to participate.
- Related research: willingness to participate in in-the-moment surveys triggered by metered data.

Contribution:

- Levels of willingness …
- … for combinations of 5 attributes.

Methods and data

Methods: a conjoint approach

Choice Based Conjoint analysis:

- A method to assess the influence of each attribute by the analysis of choices.

- 10 questions per participant: 2 proposals + "I would not participate".

- Orthogonal design (minimum correlation between attribute-levels)

- Multinomial model + Bayesian analysis using simulation (MCMC*).

- "Utilities" (coefficients) used to estimate **importance** of attributes and **willingness to participate** in each scenario, for each participant.

* =Markov Chain Monte Carlo

About the attributes

We study the effect of 6 attributes, 2-6 levels per attribute.

Research activity:	Project duration:	Invitation lifetime*:	Geolocation incentive:	Survey incentive level:	Length of the interview:
Sharing geolocation *vs.* In-the-moment surveys triggered by geolocation	1 week 1 month 3 month 6 month 1 year Indefinite	15 min 30 min 1 h 2 h 3 h 6 h 12 h	1 point/week 2 points/week 3 points/week 4 points/week 6 points/week 8 points/week	X 1 (normal) X 1.5 X 2 X 3 x 4	1 min 5 min 10 min 15 min 20 min

*=maximum time to participate

Data

- Data collection: 21st of February – 7th of March 2022.

- Netquest opt-in online panel in Spain.

- **1,016 valid surveys** (2,306 invited, 1,847 started the survey, 461 discarded due to quotas and filters)

- Valid surveys equally distributed among the 3 groups (neutral, commitment and safety).

- Survey length: mean = 8.8 min.

- Quotas on age(3)+gender(2) and education(3), representative of the Spanish online population.

The intervention (experimental groups)

Initial questions (gender, age...)

Activities' descriptions

Instructions about the choice questions

Choice questions (×10)

Questions about potential scenarios

Survey evaluation

The intervention (experimental groups)

Initial questions (gender, age…)

1 Activities' descriptions
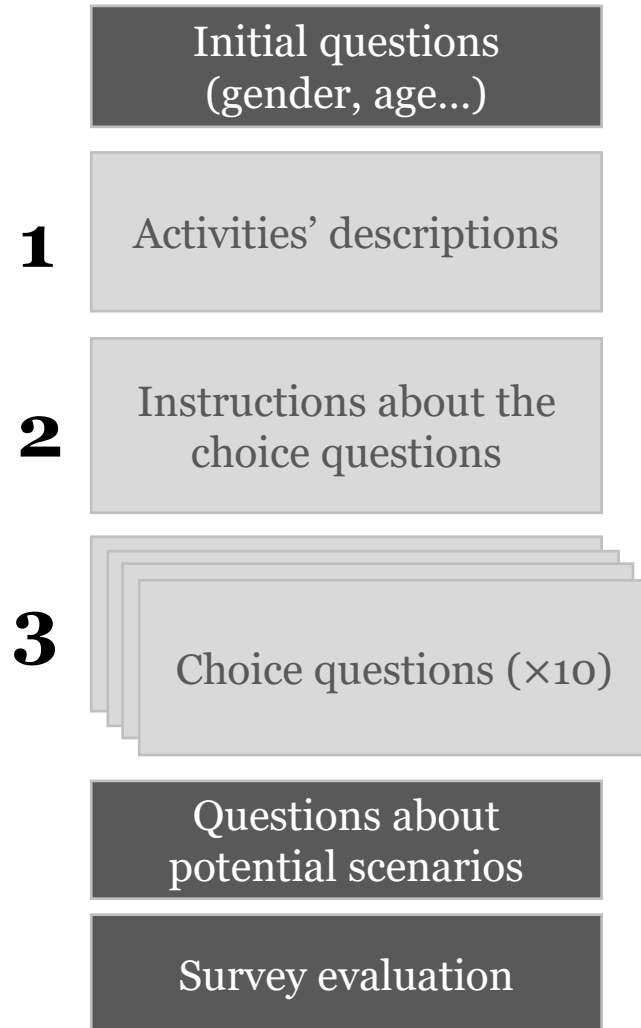
2 Instructions about the choice questions

3 Choice questions (×10)

Questions about potential scenarios

Survey evaluation

The intervention (experimental groups)

Page 1: Activities' descriptions (neutral)

We want to know whether you would participate in two types of activities:

1. Sharing your geolocation

- To participate, you would have to install an app on your smartphone that would send us your geolocation for a certain time.
- This information would be used, for example, to study the mobility of the population (distances traveled per day, hours of greatest mobility...).

2. "In-the-moment" survey based on your geolocation

- To participate, you would have to install an app on your smartphone that would analyze your geolocation to detect if you access a place of interest defined in advance, such as if you travel to a specific city or visit a store.
- If you access such location, we will send you (through the app) an invitation to participate in a survey that must be completed within a time limit.
- Your geolocation would not be stored; it would only be used to detect your access to the place of interest. If you are invited to take part in the survey and participate, the activity will end. Otherwise, you would continue sharing data up to a certain maximum time.

You could leave the activities at any time. In that case, you would keep the points earned so far.

Page 1: Activities' descriptions (neutral)

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You could leave the activities at any time. In that case, you would keep the points earned so far.

We want to know whether you would commit to participate in two types of activities:

1. Sharing your geolocation

- To participate, you would have to install an app on your smartphone that would send us your geolocation for a certain time.
- This information would be used, for example, to study the mobility of the population (distances traveled per day, hours of greatest mobility...).

2. "In-the-moment" survey based on your geolocation

- To participate, you would have to install an app on your smartphone that would analyze your geolocation to detect if you access a place of interest defined in advance, such as if you travel to a specific city or visit a store.
- If you access such location, we will send you (through the app) an invitation to participate in a survey that must be completed within a time limit.
- Your geolocation would not be stored; it would only be used to detect your access to the place of interest. If you are invited to take part in the survey and participate, the activity will end. Otherwise, you would continue sharing data up to a certain maximum time.

You could leave the activities at any time. In that case, you would keep the points earned so far.

If you would participate in these activities, it is very important that you commit to complete them.

Page 1: Activities' descriptions (safety)

We want to know whether you would participate in two types of activities:

1. Sharing your geolocation

- To participate, you would have to install an app on your smartphone that would send us your geolocation for a certain time.
- This information would be used, for example, to study the mobility of the population (distances traveled per day, hours of greatest mobility...).

2. "In-the-moment" survey based on your geolocation

- To participate, you would have to install an app on your smartphone that would analyze your geolocation to detect if you access a place of interest defined in advance, such as if you travel to a specific city or visit a store.
- If you access such location, we will send you (through the app) an invitation to participate in a survey that must be completed within a time limit.
- Your geolocation would not be stored; it would only be used to detect your access to the place of interest. If you are invited to take part in the survey and participate, the activity will end. Otherwise, you would continue sharing data up to a certain maximum time.

Your geolocation data would only be used for the purpose described. They would be collected with the maximum-security measures and would be eliminated as soon as they were analyzed.

You could leave the activities at any time. In that case, you would keep the points earned so far.

You will be presented **10 questions** with **2 proposed activities**. Each activity includes the following information:

1. **Type of activity**: sharing your geolocation or "in-the-moment" survey based on your geolocation.
2. **Time during which you would share your geolocation**.
3. **Points per week** that you would get for sharing your geolocation.

If the activity is an "in-the-moment" survey, you will also see:
1. **Duration of the survey**.
2. **Maximum time to access** the survey.
3. **Points for completing the survey** that you would get if you do so within the maximum period indicated.

Pay attention to the 10 questions, they are different from each other. If you would not participate in any case, press the "I would not participate" option.

Page 2: Instructions (commitment)

You will be presented **10 questions** with **2 proposed activities**. Each activity includes the following information:

1. **Type of activity**: sharing your geolocation or "in-the-moment" survey based on your geolocation.
2. **Time during which you would share your geolocation**.
3. **Points per week** that you would get for sharing your geolocation.

If the activity is an "in-the-moment" survey, you will also see:
1. **Duration of the survey**.
2. **Maximum time to access** the survey.
3. **Points for completing the survey** that you would get if you do so within the maximum period indicated.

Pay attention to the 10 questions, they are different from each other. If you are not sure that you would commit, press the "I would not commit to participate" option.

You will be presented **10 questions** with **2 proposed activities**. Each activity includes the following information:

1. **Type of activity**: sharing your geolocation or "in-the-moment" survey based on your geolocation.
2. **Time during which you would share your geolocation**.
3. **Points per week** that you would get for sharing your geolocation.

If the activity is an "in-the-moment" survey, you will also see:
1. **Duration of the survey**.
2. **Maximum time to access** the survey.
3. **Points for completing the survey** that you would get if you do so within the maximum period indicated.

Remember that in all cases your geolocation would be handled with the maximum-security measures and would be eliminated as soon as it was analyzed.

Pay attention to the 10 questions, they are different from each other. If you would not participate in any case, press the "I would not participate" option.

Page 3: Choice questions (neutral)

In which of these proposals would you participate?

If you would participate in both, choose the one you would prefer first. If you would not participate in any, check the option 'I would not participate'

Proposal A	Proposal B	
Activity	*Activity*	
In-the-moment survey triggered by your geolocation	Sharing geolocation data	
Time sharing your geolocation	*Time sharing your geolocation*	I would not participate
6 months	1 month	
(…)	(…)	

In which of these proposals would you participate?

If you would commit to participate in both, choose the one you would prefer first. If you would not commit to participate in any, check the option 'I would not commit to participate'

Proposal A

Activity
In-the-moment survey triggered by your geolocation

Time sharing your geolocation
6 months

(...)

Proposal B

Activity
Sharing geolocation data

Time sharing your geolocation
1 month

(...)

I would not commit to participate

Page 3: Choice questions (safety)

In which of these proposals would you participate?

If you would participate in both, choose the one you would prefer first. If you would not participate in any, check the option 'I would not participate'

Remember that in all cases your geolocation would be handled with the maximum-security measures and would be deleted as soon as it was analyzed.

Proposal A	Proposal B	
Activity In-the-moment survey triggered by your geolocation *Time sharing your geolocation* 6 months (...)	*Activity* Sharing geolocation data *Time sharing your geolocation* 1 month (...)	I would not participate

Results

Willingness to participate

Activity	Mean willingness to participate (%)		
	Neutral	**Commitment**	**Safety**
Sharing geolocation data	47.4		
In-the-moment surveys	50.3		

Neutral group:

- Slightly higher willingness for in-the-moment surveys: +2.9pp (+5.8%)

- Potential explanation: geolocation data not indefinitely stored?

Willingness to participate

Activity	Mean willingness to participate (%)		
	Neutral	**Commitment**	**Safety**
Sharing geolocation data	47.4 [a]	40.4 [a]	
In-the-moment surveys	50.3 [a]	43.7 [a]	

Note: letters a, b or c in two columns indicate that there is a significant difference (5% level) between them.

First hypothesis confirmed:

✓ **H1**: When the need to commit was emphasized, the willingness was negatively affected in both activities: -7.0 (-14.8%) and -6.6 pp (-13.1%) respectively, both statistically significant.

Willingness to participate

Activity	Mean willingness to participate (%)		
	Neutral	**Commitment**	**Safety**
Sharing geolocation data	47.4 [a,b]	40.4 [a]	41.5 [b]
In-the-moment surveys	50.3 [a,b]	43.7 [a,c]	46.2 [b,c]

Note: letters a, b or c in two columns indicate that there is a significant difference (5% level) between them.

Second hypothesis also confirmed:

✓ **H1**: When the need to commit was emphasized, the willingness was negatively affected in both activities: -7.0 pp (-14.8%) and -6.6 pp (-13.1%) respectively, both statistically significant.

✓ **H2**: repeatedly emphasizing safety assurances did not increase willingness; instead, it led to a decrease of -5.9 pp (-12.4%) and -4.1 pp (-8.2%), both significant.

Willingness to participate: relative effects
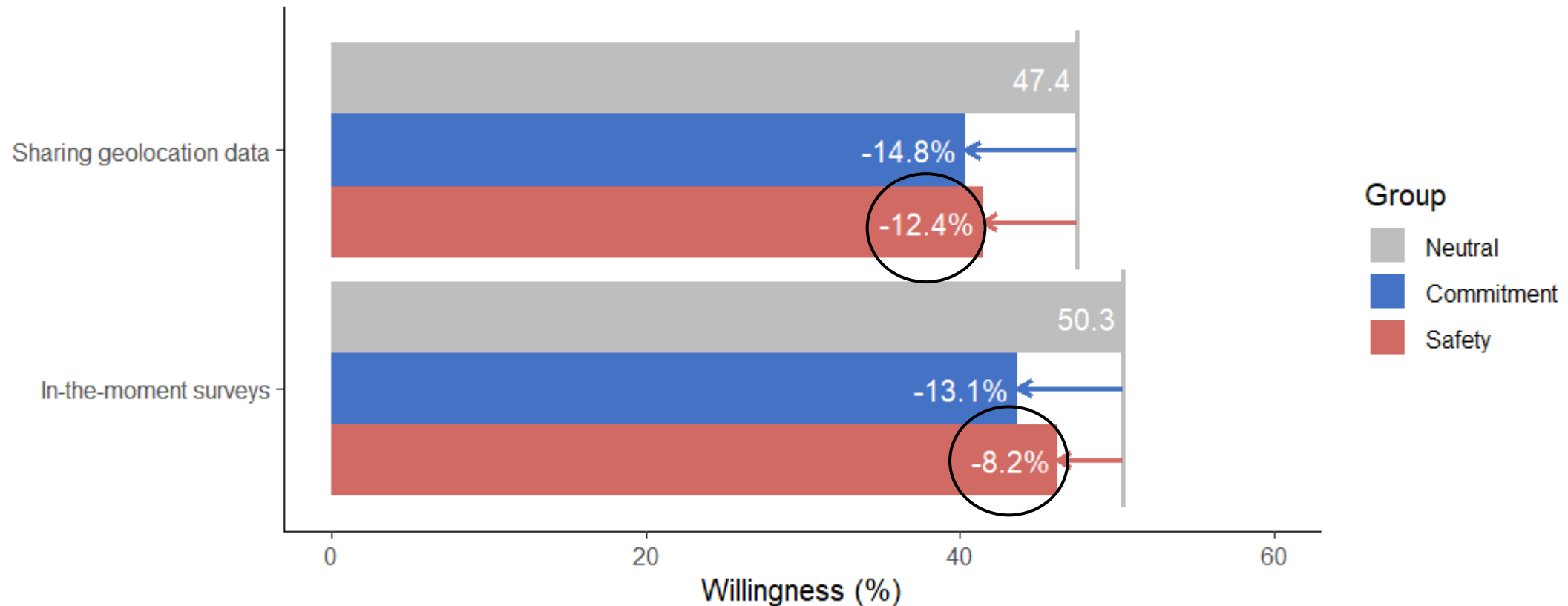
- In relative terms, emphasizing "data safety" affects significantly more "sharing geolocation data" than "in-the-moment surveys" → greater negative impact on activities involving more sensitive data.
- Trying to anticipate potential concerns in the description seems counterproductive.

Willingness to participate: attribute importance*

Activity	Attribute	Importance per attribute (%)		
		Neutral	**Commitment**	**Safety**
Sharing	Project duration	51.8		
geolocation data	Geolocation incentive	48.2		

Importance = estimation of the "weight" that each attribute had on participants' decisions.

Willingness to participate: attribute importance

Activity	Attribute	Importance per attribute (%)		
		Neutral	**Commitment**	**Safety**
Sharing	Project duration	51.8 [a]	**66.0 [a]**	
geolocation data	Geolocation incentive	48.2 [a]	34.0 [a]	

Willingness to participate: attribute importance

Activity	Attribute	Importance per attribute (%)		
		Neutral	**Commitment**	**Safety**
Sharing	Project duration	51.8 [a]	**66.0 [a]**	**64.5**
geolocation data	Geolocation incentive	48.2 [a]	34.0 [a]	35.5

Willingness to participate

Activity	Attribute	Importance per attribute (%)		
		Neutral	**Commitment**	**Safety**
Sharing geolocation data	Project duration	51.8 [a]	66.0 [a]	64.5
	Geolocation incentive	48.2 [a]	34.0 [a]	35.5
In-the-moment surveys	Project duration	21.6		
	Geolocation incentive	20.0		
	Survey incentive	23.8		
	Invitation lifetime	18.0		
	Survey length	16.6		

Willingness to participate

Activity	Attribute	Importance per attribute (%)		
		Neutral	**Commitment**	**Safety**
Sharing	Project duration	51.8 [a]	66.0 [a]	64.5
geolocation data	Geolocation incentive	48.2 [a]	34.0 [a]	35.5
In-the-moment surveys	Project duration	21.6 [a]	**33.5 [a]**	
	Geolocation incentive	20.0	17.2	
	Survey incentive	**23.8 [a]**	15.2 [a]	
	Invitation lifetime	18.0	20.8	
	Survey length	16.6	13.3	

Willingness to participate

Activity	Attribute	Importance per attribute (%)		
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Sharing	Project duration	51.8 [a]	66.0 [a]	64.5
geolocation data	Geolocation incentive	48.2 [a]	34.0 [a]	35.5
In-the-moment surveys	Project duration	21.6 [a]	**33.5 [a]**	**28.7**
	Geolocation incentive	20.0	17.2	15.8
	Survey incentive	**23.8 [a]**	15.2 [a]	18.4
	Invitation lifetime	18.0	20.8	20.7
	Survey length	16.6	13.3	16.4

Willingness to participate

Activity	Attribute	Importance per attribute (%)		
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Sharing geolocation data	Project duration	51.8 [a]	66.0 [a]	64.5
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	Invitation lifetime	18.0	20.8	20.7
	Survey length	16.6	13.3	16.4
Both activities	Type of activity	5.3		
	Rest of attributes	94.7		

Willingness to participate

Activity	Attribute	Importance per attribute (%)		
		Neutral	**Commitment**	**Safety**
Sharing geolocation data	Project duration	51.8 [a]	66.0 [a]	64.5
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In-the-moment surveys	Project duration	21.6 [a]	33.5 [a]	28.7
	Geolocation incentive	20.0	17.2	15.8
	Survey incentive	23.8 [a]	15.2 [a]	18.4
	Invitation lifetime	18.0	20.8	20.7
	Survey length	16.6	13.3	16.4
Both activities	Type of activity	5.3	4.3	
	Rest of attributes	94.7	95.7	

Willingness to participate

Activity	Attribute	Importance per attribute (%)		
		Neutral	**Commitment**	**Safety**
Sharing geolocation data	Project duration	51.8 [a]	66.0 [a]	64.5
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	Geolocation incentive	20.0	17.2	15.8
	Survey incentive	23.8 [a]	15.2 [a]	18.4
	Invitation lifetime	18.0	20.8	20.7
	Survey length	16.6	13.3	16.4
Both activities	Type of activity	5.3	4.3 [b]	**11.3** [b]
	Rest of attributes	94.7	95.7 [b]	88.7 [b]

Permanent storage of information?

Conclusions

Summary

- Estimates of willingness to share data obtained are substantially affected by the way research activities are presented to individuals.

- Emphasizing the need to commit negatively affects willingness (up to -7 pp)

- When safety assurances are added to activities' descriptions, willingness to participate also drops (up to -5.9 pp).

- These effects were found to be associated to a shift in the relative importance given to the attributes of the activities.
  - Commitment → Project duration becomes more relevant
  - Safety → The distinction between projects become more relevant

Recommendations

- Researchers should be aware that the descriptions of activities can influence the levels of willingness to participate, intentionally or unintentionally.

- Researchers should <u>carefully evaluate the way research activities are presented</u> to participants.

- While participants must be informed of the implications of their participation and their safety guaranteed, <u>researchers should avoid redundant safety assurances</u> in activities' descriptions.

Limitations

- We have studied the (1) willingness to participate (and not actual participation), (2) in certain research activities, and (3) based on a sample of participants who are accustomed to participating in surveys and other research activities.

- However, there is nothing to suggest that these effects would not be observed in actual participation, with other types of activities or with different participants, although the magnitude of the effects may differ.

- Further research is necessary to
  - test the robustness of these results.
  - determine whether positive framing (e.g., emphasizing incentives) significantly increases willingness
  - assess whether these findings apply to conventional survey questions about willingness (non-conjoint questionnaires).

More information and references

About framing effects...

Ochoa, C., Revilla, M. (2023). Framing Effects on Willingness to Participate in Geolocation-Based Research. International Journal of Market Research, 0(0). https://doi.org/10.1177/14707853231170107. Preprint: https://osf.io/w2znc

About geolocation-based research...

Ochoa, C. (2022). Willingness to participate in geolocation-based research. PLoS ONE 17(12): e0278416. https://doi.org/10.1371/journal.pone.0278416.

Thanks!

Questions?

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https://www.upf.edu/web/webdataopp