

Assessing the relative importance of 'mechanical' and 'relational' aspects of digital trust in willingness to take part in app-based surveys

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Context

Since researchers have begun integrating smartphone apps into the data collection process, a growing body of research has been investigating the factors associated with public willingness to participate via this mode. Research to date can be broadly divided into studies focusing on correlates of *hypothetical* willingness and those examining *actual* participation rates in app-based studies, both of which have contributed to what is currently known about drivers of resistance. A consistent finding is that concerns about online data privacy and security, as well as trust in surveys and researchers, appear to play an important role in participation decisions. However, synthesising this literature remains difficult due to substantial variation in study designs, samples types, data types collected, and in how these different attitudinal variables have been operationalised. This not only hinders comparisons across studies but may obscure structural effects of interest due to variability in effect sizes across studies.

Identifying which sources of mistrust and which types of concerns drive non-participation is key for developing potential remedies. In this study, we contribute to this endeavour by linking these variables to two key dimensions of the broader concept of 'digital trust' (Chew et al., 2023; DT): 'mechanical DT', which concerns the perceived trustworthiness of a given technology, and 'relational DT', which concerns trust in the actors involved in data collection. However, it remains unclear whether these different DT dimensions are equally important for understanding willingness to participate in app-based surveys, or whether their influence differs between hypothetical willingness to participate and actual participation.

This study therefore examines whether mechanical and relational components of DT differ in how they relate to willingness to participate in app-based surveys, both at the level of stated willingness and actual behaviour. Accordingly, we address the following research questions:

RQ1: How are different dimensions of DT associated with hypothetical willingness to download a survey research app?

RQ2: Do the associations between different DT components and hypothetical willingness to download a survey app persist when examining actual participation in an app-based survey?

Specifically, we test the following hypotheses:

- H1:** Higher levels of RDT are positively associated with stated willingness to download a research app.
- H2:** Higher levels of MDT (i.e., lower levels of concern about data privacy and security) are positively associated with willingness to download a research app.
- H3:** When RDT and MDT are entered simultaneously in the full model, both will be independently associated with willingness to download a research app.
- H4:** The association between MDT and actual participation in an app-based survey will be attenuated relative to the hypothetical willingness findings, such that the negative relationship between privacy and security concerns and participation will be weaker or absent altogether.
- H5:** The association between RDT and actual participation will persist relative to the hypothetical willingness findings.

Methods

The data come from two surveys conducted in Switzerland: (1) the 2024 wave of the MOSAiCH survey (Ernst Stähli et al., 2025b), and (2) a 2026 pilot time-use survey ('Daily LIVES') using the MOTUS app. Participants in the pilot were recruited from MOSAiCH respondents who had consented to be recontacted. MOSAiCH is a two-part self-administered (push-to-web) survey and the 2024 edition focused on the theme of "Digital Societies" (Ernst Stähli et al., 2025a). In the present study, we analyse questions proposed by the second author via an open Call for proposals.

The target population is adults (18+) living in private households in Switzerland. A simple random sample of 5,943 individuals was drawn from the population register. Data collection followed a standard protocol (prenotification, invitation, and reminders; see Ernst Stähli et al., 2025a for more information). The Daily LIVES survey was designed as an online Time Use Survey, including a baseline questionnaire and up to two time diaries, each with a short post-survey questionnaire. The survey had a 'push-to-app' design; the sample was invited to participate using the Modular Time Use Survey (MOTUS) research platform (Minnen et al., 2023). Invitations were sent by mail, followed by email and postcard reminders.

Analyses were restricted to MOSAiCH respondents who completed both parts of the survey online and lived in the German- or French-speaking regions of Switzerland, as the Daily LIVES survey was conducted only in German and French. Among respondents meeting these criteria, 675 were eligible (and able) to be recontacted and invited to the Daily LIVES survey. Complete-case analyses resulted in a final analytical sample of $n=1,220$. Respondents who were not eligible for recontact were retained in the analyses and coded as non-participants for the *actual participation* outcomes.

Measures

Table 1: *Measures used in the analysis ($n = 1,220$)**

Construct	Original items	Range	Median	Mean	SD
Online privacy concerns	DIGS26, DIGS24a-b	1-5	3.7	3.7	0.8
Security concerns using a research app: questionnaire	DIGS36a	1-5	3	2.6	1
Perceived level of control over personal data	DIGS28	1-5	2	2.2	0.8
Trust in data protection regulations	DIGS29	1-5	3	2.6	0.7
Trust in university research centres to protect data	DIGS30c	1-5	3	3.2	0.8
Trust in institution: university research centres	DIGS23d	1-11	9	8.1	2.1
Trust in surveys results	DIGS41	1-5	3	3.3	0.6
Digital skills	DIG10a-d	1-5	4	4.1	0.7
Attitude toward technology	DIG17a, c	1-5	4	3.9	0.6
Social trust	DIG25	1-11	6	5.9	2.4
Willingness to download a research app: questionnaire	DIGS35a	Not willing 73%	Willing 27%		
Participate to the TUS survey		No 82%	Yes 18%		
Participate to the TUS survey via the app		No 87.9%	Yes 12.1%		
Ever downloaded scientific study app	DIGS38	No 94.8%	Yes 5.2%		
Phone operator	DIGS34	Other 47.5%	iPhone 52.5%		
Education level	EDU1CHISCED	Lower secondary or less 8.4%	Upper secondary 50.7%	Tertiary 40.8%	
Language region	langreg_2020	German 74.9%	French 25.1%		
Sex	sex	Male 52.6%	Female 47.4%		
Age	age7	-25 8.9%	26-35 15.5%	36-45 17.9%	46-55 18.9%
		56-65 21.3%	66-75 11.7%	76- 5.9%	

Note: * Percentages of actual participation should be interpreted carefully as they are related to the analytic sample, and not everyone was invited to participate to the Daily LIVES survey. Participant who were not eligible and participant who refused to participate are grouped together.

Analytic approach

To test the hypotheses, we estimated a series of logistic regression models for each outcome of interest: hypothetical willingness to install a survey app, actual participation via any mode, and actual participation via the app. For each outcome, models were estimated sequentially by first including control variables only, then adding the MDT block, and finally the RDT block. This approach allowed us to assess the contribution of each block of predictors. Only the full models are presented here.

Table 2: *Descriptive and association of willingness to download an app (hypothetical and actual) with predictors*

	Willingness to download a research app: questionnaire ¹				Participate to the TUS survey ²				Participate to the TUS survey via the app ³			
	Not willing		Willing		No		Yes		No		Yes	
	N=891		N=329		N=1001		N=219		N=1072		N=148	
	%	(SE)	%	(SE) <i>p</i>	%	(SE)	%	(SE) <i>p</i>	%	(SE)	%	(SE) <i>p</i>
Online privacy concerns												
<i>Mean (SD)</i>	3.8	(0.76)	3.62	(0.9)**	3.77	(0.79)	3.67	(0.86)	3.76	(0.79)	3.67	(0.9)
Security concerns using a research app: questionnaire												
<i>Mean (SD)</i>	2.78	(1.01)	2.13	(0.86)***	2.67	(1.01)	2.33	(0.98)***	2.65	(1.01)	2.27	(0.96)***
Perceived level of control over personal data												
<i>Mean (SD)</i>	2.23	(0.83)	2.3	(0.84)	2.25	(0.83)	2.23	(0.84)	2.24	(0.83)	2.25	(0.86)
Trust in data protection regulations												
<i>Mean (SD)</i>	2.55	(0.73)	2.69	(0.79)*	2.58	(0.75)	2.64	(0.74)	2.59	(0.75)	2.61	(0.77)
Trust in university research centres to protect data												
<i>Mean (SD)</i>	3.15	(0.8)	3.47	(0.82)***	3.19	(0.82)	3.45	(0.8)***	3.2	(0.81)	3.51	(0.84)***
Trust in institution: university research centres												
<i>Mean (SD)</i>	7.86	(2.1)	8.62	(1.89)***	7.96	(2.09)	8.53	(1.94)***	8	(2.07)	8.49	(2.08)**
Digital skills												
<i>Mean (SD)</i>	3.98	(0.72)	4.26	(0.57)***	4.04	(0.71)	4.13	(0.62)	4.05	(0.71)	4.14	(0.58)
Attitude toward technology												
<i>Mean (SD)</i>	3.83	(0.63)	4	(0.66)***	3.87	(0.63)	3.89	(0.68)	3.87	(0.63)	3.9	(0.7)
Social trust												
<i>Mean (SD)</i>	5.86	(2.39)	6.06	(2.49)	5.83	(2.43)	6.31	(2.33)*	5.85	(2.4)	6.36	(2.54)*
Ever downloaded scientific study app												
<i>No</i>	96.5	(0.6)	90	(1.7)***	95.9	(0.6)	89.5	(2.2)***	95.6	(0.6)	88.5	(2.8)***
<i>Yes</i>	3.5	(3.3)	10	(5.2)	4.1	(3.1)	10.5	(6.4)	4.4	(3)	11.5	(7.7)
Phone operator												
<i>Other</i>	49.4	(2.4)	42.2	(4.2)*	47.7	(2.3)	46.6	(4.9)	47.9	(2.2)	43.9	(6.2)
<i>iPhone</i>	50.6	(2.4)	57.8	(3.6)	52.3	(2.2)	53.4	(4.6)	52.1	(2.1)	56.1	(5.4)

Note:¹ Comparison between being willing and not willing to download an app for survey. ² Comparison between participation to the TUS via any mode and non-participation ³ Comparison between participation to the TUS via the app and participation via browser/non-participation. Comparison: categorical variables = chi-squared test, continuous variables = Wilcoxon or Kruskal-Wallis test depending on the number of levels. For continuous variable, mean and Standard Deviations are computed. SE = Standard Errors; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Results

Tables 2 and 3 present bivariate associations and full models results respectively. Findings are summarised below by hypothesis, with results based on the current model specifications.

H1: No clear support in the full multivariable model. However, bivariate associations were in the expected direction, suggesting that relational trust may play a role that is difficult to disentangle from related constructs such as trust in surveys. Clarifying the independent contribution of RDT is ongoing work.

H2: Partial support is found. Among the MDT dimensions, only app-specific security concerns (the most context-specific indicator in the model) show a consistent association with both hypothetical willingness and actual participation. General privacy attitudes, perceived control, and trust in regulations do not show significant independent effects.

H3: The joint inclusion of RDT and MDT does not provide evidence for two clearly independent pathways. In the full models, security concerns remain strong predictors of the probability of (hypothetical or actual) participation, whereas RDT does not. Trust in surveys does, however. This may indicate overlap between the constructs or shared explanatory variance rather than fully distinct mechanisms.

H4: Supported in direction. The negative association between security concerns and participation weakened substantially compared to stated willingness, though it did not disappear entirely. This suggests that security concerns may be more relevant for intentions than for realised behaviour.

H5: Evidence is mixed. RDT does not show a robust association with general participation in the current models, but there is a tentative positive association for app-based participation. This may indicate that relational trust becomes more relevant if app participation is required to take-part in the study, but remains less important than trust in surveys per se.

Note: These results are preliminary, and intermediate model specifications are still being examined.

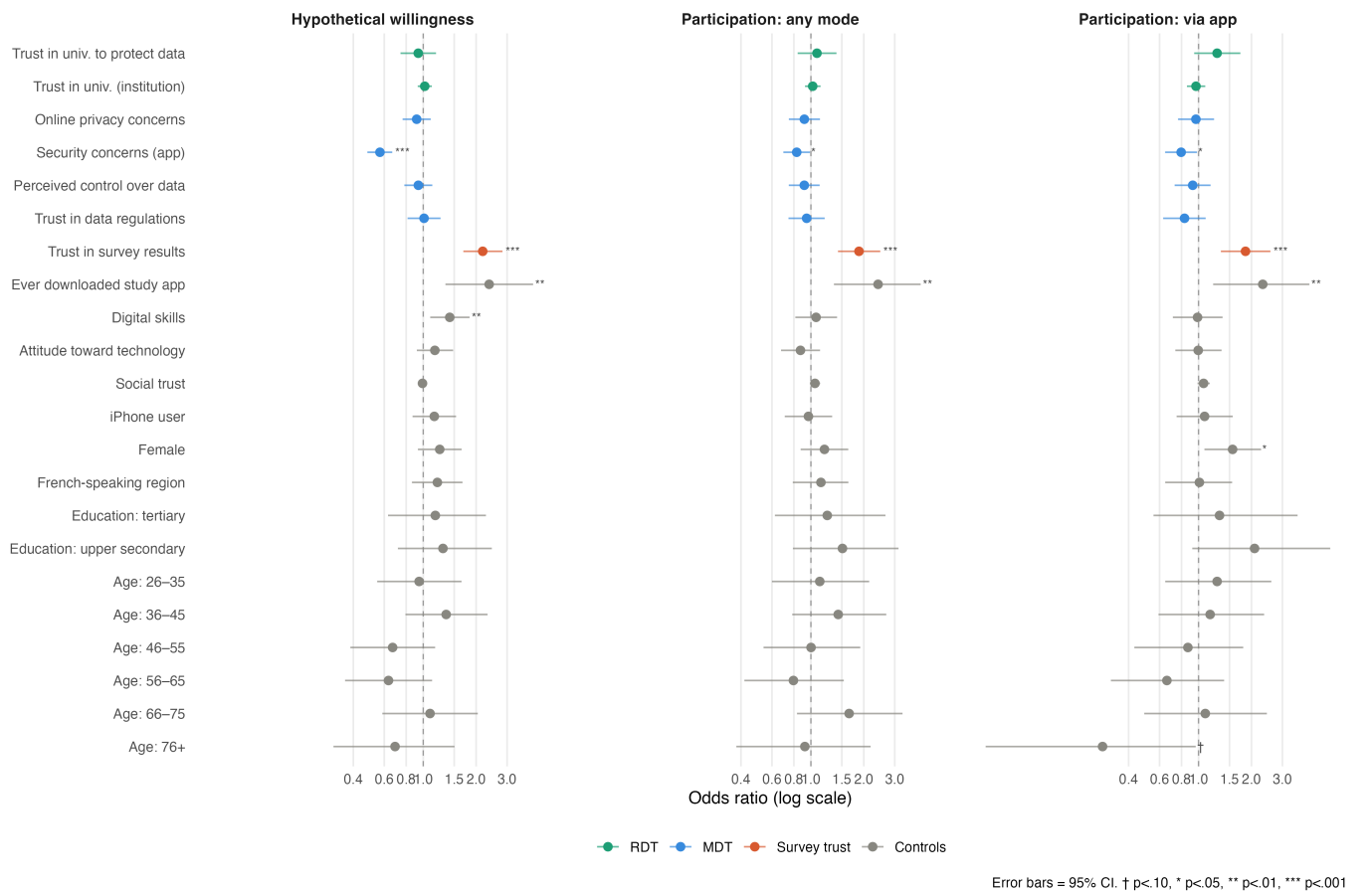


Figure 1: *Mechanical and relational digital trust as predictors of app survey participation*

Table 3: *Logistic Regression Coefficients from Models Predicting Hypothetical Willingness to Install a Survey App to Complete Questionnaires, Actual Participation to a Push-to-App survey via any Mode, and Actual Participation via the App*

	(1) Hypothetical willingness					(2) Participation via any mode					(3) Participation via the app				
	$\hat{\beta}$	SE	95% CI	p	OR	$\hat{\beta}$	SE	95% CI	p	OR	$\hat{\beta}$	SE	95% CI	p	OR
RDT block															
Trust in university research centres to protect data	-0.07	0.12	[-0.30, 0.17]		0.94	0.08	0.13	[-0.17, 0.33]		1.08	0.24	0.15	[-0.06, 0.55]		1.28
Trust in institution: university research centres	0.02	0.05	[-0.07, 0.11]		1.02	0.02	0.05	[-0.08, 0.13]		1.02	-0.03	0.06	[-0.15, 0.09]		0.97
MDT block															
Online privacy concerns	-0.09	0.09	[-0.27, 0.10]		0.92	-0.09	0.10	[-0.29, 0.12]		0.92	-0.03	0.12	[-0.27, 0.20]		0.97
Security concerns using a research app: questionnaire	-0.57	0.08	[-0.73, -0.40]	***	0.57	-0.19	0.09	[-0.36, -0.01]	*	0.83	-0.23	0.11	[-0.44, -0.02]	*	0.80
Perceived level of control over personal data	-0.06	0.09	[-0.25, 0.12]		0.94	-0.09	0.10	[-0.29, 0.12]		0.92	-0.08	0.12	[-0.31, 0.16]		0.93
Trust in data protection regulations	0.01	0.11	[-0.21, 0.23]		1.01	-0.06	0.12	[-0.29, 0.18]		0.95	-0.18	0.14	[-0.46, 0.09]		0.83
Survey attitude															
Trust in surveys results	0.78	0.13	[0.52, 1.04]	***	2.18	0.63	0.14	[0.35, 0.91]	***	1.88	0.62	0.17	[0.29, 0.94]	***	1.85
Control variables															
Digital skills	0.35	0.13	[0.09, 0.60]	**	1.42	0.07	0.14	[-0.21, 0.34]		1.07	-0.01	0.17	[-0.34, 0.31]		0.99
Attitude toward technology	0.15	0.12	[-0.09, 0.39]		1.16	-0.14	0.13	[-0.39, 0.12]		0.87	-0.00	0.15	[-0.31, 0.30]		1.00
Social trust	-0.01	0.03	[-0.07, 0.05]		0.99	0.05	0.03	[-0.01, 0.12]		1.05	0.07	0.04	[-0.01, 0.15]		1.07
Ever downloaded scientific study app: Yes (ref.: No)	0.86	0.29	[0.29, 1.44]	**	2.37	0.88	0.29	[0.31, 1.45]	**	2.41	0.84	0.32	[0.21, 1.47]	**	2.32
Phone operator: iPhone (ref.: Other)	0.14	0.15	[-0.14, 0.43]		1.16	-0.03	0.16	[-0.34, 0.28]		0.97	0.08	0.19	[-0.29, 0.45]		1.08
Sociodemographic variables															
Education level (ref.: Lower secondary or less)															
Upper secondary	0.26	0.31	[-0.35, 0.87]		1.29	0.41	0.35	[-0.27, 1.10]		1.51	0.73	0.45	[-0.16, 1.62]		2.08
Tertiary	0.16	0.33	[-0.48, 0.80]		1.17	0.21	0.37	[-0.50, 0.93]		1.24	0.27	0.47	[-0.65, 1.20]		1.32
Language region: French (ref.: German)	0.19	0.17	[-0.15, 0.52]		1.20	0.13	0.19	[-0.23, 0.50]		1.14	0.01	0.22	[-0.43, 0.45]		1.01
Sex: Female (ref.: Male)	0.22	0.15	[-0.07, 0.50]		1.24	0.18	0.16	[-0.13, 0.49]		1.19	0.45	0.19	[0.08, 0.82]	*	1.56
Age (ref.: -25)															
26-35	-0.05	0.28	[-0.61, 0.50]		0.95	0.12	0.32	[-0.52, 0.75]		1.12	0.24	0.35	[-0.45, 0.93]		1.28
36-45	0.30	0.27	[-0.24, 0.84]		1.35	0.36	0.31	[-0.26, 0.97]		1.43	0.15	0.35	[-0.54, 0.84]		1.16
46-55	-0.40	0.28	[-0.96, 0.15]		0.67	0.00	0.32	[-0.63, 0.63]		1.00	-0.14	0.36	[-0.85, 0.57]		0.87
56-65	-0.46	0.29	[-1.02, 0.11]		0.63	-0.23	0.33	[-0.88, 0.42]		0.80	-0.41	0.38	[-1.15, 0.32]		0.66
66-75	0.09	0.32	[-0.54, 0.71]		1.09	0.50	0.35	[-0.19, 1.19]		1.65	0.09	0.41	[-0.71, 0.89]		1.09
76-	-0.37	0.40	[-1.16, 0.42]		0.69	-0.08	0.45	[-0.95, 0.79]		0.92	-1.26	0.68	[-2.59, 0.08]	†	0.28
Intercept	-4.05	0.96	[-5.94, -2.16]	***	0.02	-3.60	1.06	[-5.68, -1.53]	***	0.03	-4.35	1.26	[-6.82, -1.87]	***	0.01
<i>N</i>	1,220					1,220					1,220				
<i>-2LL</i>	1216.11					1071.51					825.59				
Model χ^2 (df)	206.25*** (22)					76.86*** (22)					76.07*** (22)				
Nagelkerke R^2	0.226					0.100					0.116				

Note: † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. $\hat{\beta}$ = coefficient, SE = Standard Error, CI = Confidence Interval, p = p-value, OR = Odds Ratio.

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