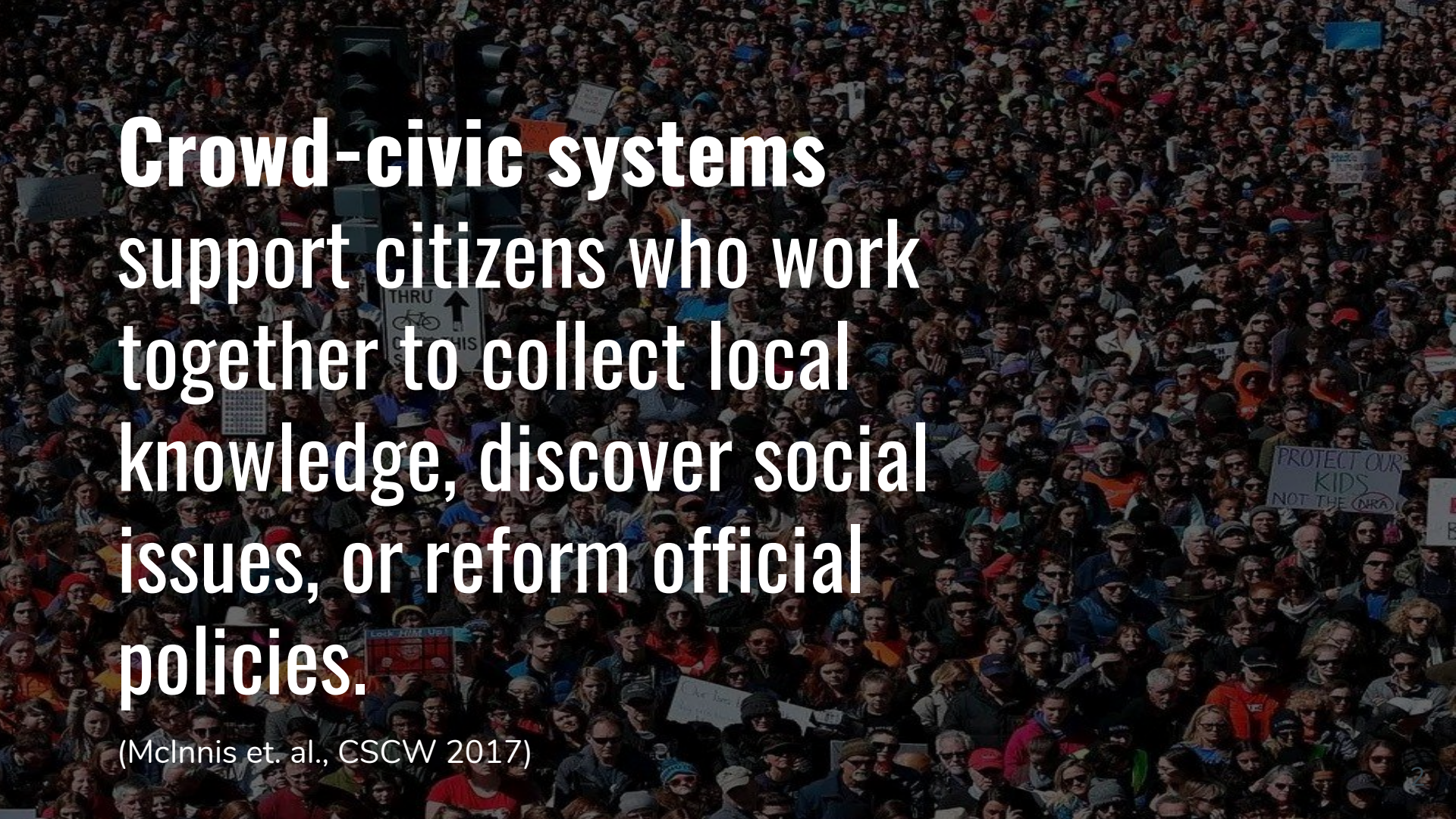


Personalized Motivation-supportive Messages for Increasing Participation in Crowd-civic Systems

Paul Grau (KAIST, TUB), Babak Naderi (TUB), Juho Kim (KAIST)

CSCW 2018



A large, dense crowd of people, likely at a protest or rally, filling the background. The crowd is diverse in age and appearance. Several signs are visible, including one that says "THRU" with a bicycle icon and an upward arrow, another that says "PROTECT OUR KIDS NOT THE OIRA", and a red sign with white text that is partially obscured. The overall atmosphere appears to be one of a significant public gathering.

Crowd-civic systems
support citizens who work
together to collect local
knowledge, discover social
issues, or reform official
policies.

(McInnis et. al., CSCW 2017)

Local Problem Reporting

FixMyStreet

Report a problem Sign in All reports Local alerts Help

CLICK MAP TO REPORT A PROBLEM

Show All reports about Everything

Sort by Newest

1 to 100 of 516 Next

- Large number of cigarette ends on pavement
10:40, Thursday, last updated 17:35, Thursday
- Drug paraphernalia
10:03, Tuesday
- Flickering lamppost
14:31, 2 Jun 2018
- Kerbstone displaced at bus stop (route 9, 10, 140)
20:21, 14 May 2018
- Rubbish
13:45, 14 May 2018
- Partial collapse of manhole

Hide pins Permalink

FixMyStreet.com

Crowdsourced Policymaking

Maastoliikennelaista. About off-road traffic

🏠 Koti | [Jatkokeskustelun aiheita](#) | [Ihmetteletkö tätä?](#) | [Yhteystiedot](#)

Ideahaku

Hae

Tervetuloa Joukkoistamista Suomessa -yhteisöön!

Tervetuloa keskustelemaan maastoliikenteestä ja sitä säätelevästä maastoliikennelaista. *Welcome to discuss about off-road traffic and the law regulating it.*

What is this about? What will happen now? How does this work? Instructions

Mistä on kysymys?

Mitä nyt tapahtuu?

Miten tämä toimii?

Ohje



Mistä on kysymys? *What is this process about?*

Ympäristöministeriö uudistaa maastoliikennelakia ja haluaa siksi kuulla mahdollisimman laajasti näkemyksiä asiasta. Maastoliikenteellä tarkoitetaan mm. moottorikelkkailua ja mönkijälläajoa luonnossa. Laki säätelee esimerkiksi sitä, missä moottorikelkalla saa ajaa ja kuinka kelkkareitit perustetaan. Lisää maastoliikenteestä ja nykyisestä laista voit lukea [maastoliikennelaki-sivustolla](#).

Vaikuta!

Have a say!

Pyydämme sinua jakamaan ajatuksesi siitä, kuinka maastoliikennettä pitäisi parhaiten säännellä. Kysymykset perustuvat edellisen vaiheen keskusteluun. Etsimme nyt ratkaisuja maastoliikenteen ja sen sääntelyn ongelmiin. Osallistu valitsemalla kysymyskategoria vasemmalta palkista. Klikkaa sitten keltaista 'Lähetä idea' -nappulaa. Ideointi jatkuu 21.6. asti.

1. vaihe:
Keskustelu

2. vaihe:
Koonti ja palaute

3. vaihe:
Jatkokeskustelu

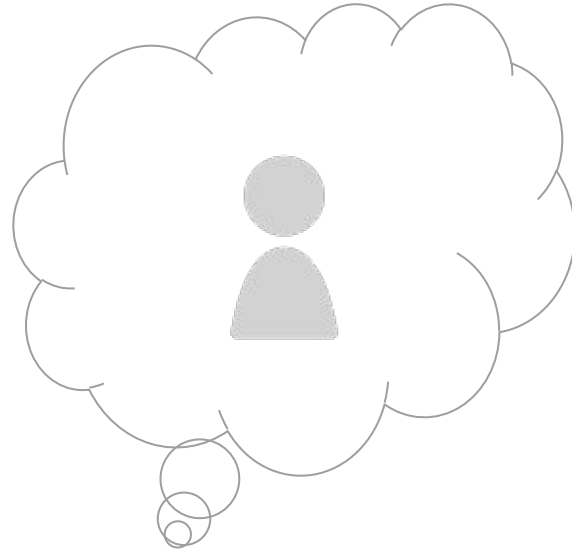
4. vaihe:
Koonti ja palaute

Lähetä uusi idea

Send a new idea!

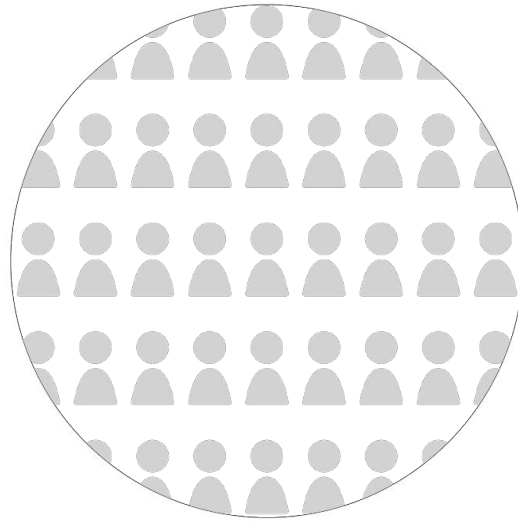
Off-road traffic law crowdsourcing in Finland [Aitamurto 2016]

A Crowd-Civic Challenge: Recruitment and Participation



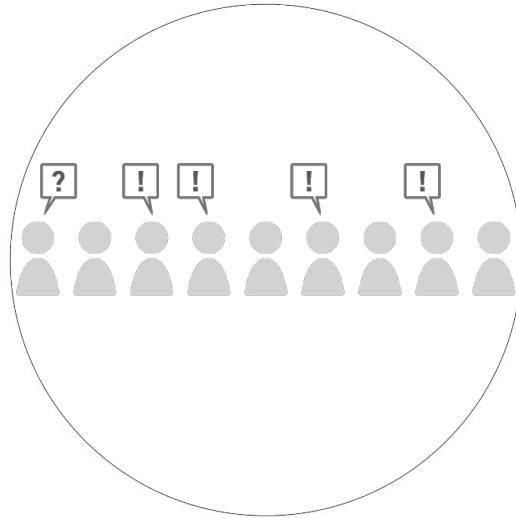
A Crowd-Civic Challenge: Recruitment and Participation

Critical mass



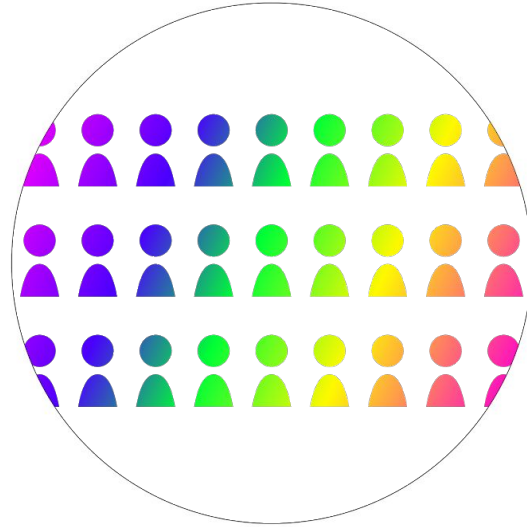
A Crowd-Civic Challenge: Recruitment and Participation

Experts

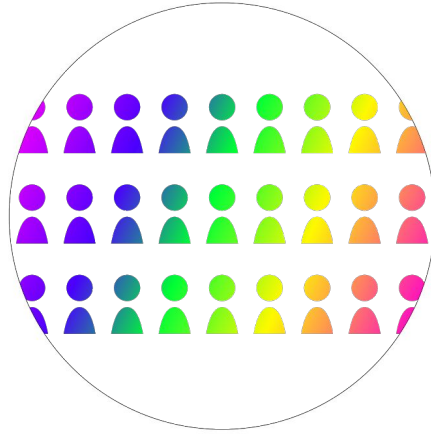


A Crowd-Civic Challenge: Recruitment and Participation

Diverse personalities



A Crowd-Civic Challenge: Recruitment and Participation



Self-selection bias

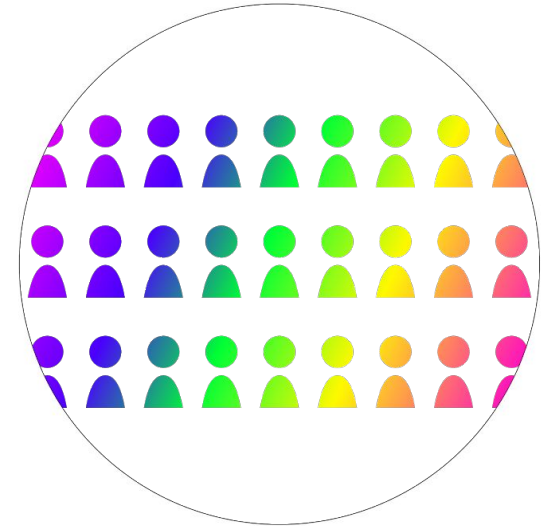
[Aitamurto 2016]

Democratic Representativeness?

Diverse Motivations to Participate Voluntarily

↳ How to move on from
“one size fits all”?

Diverse personalities

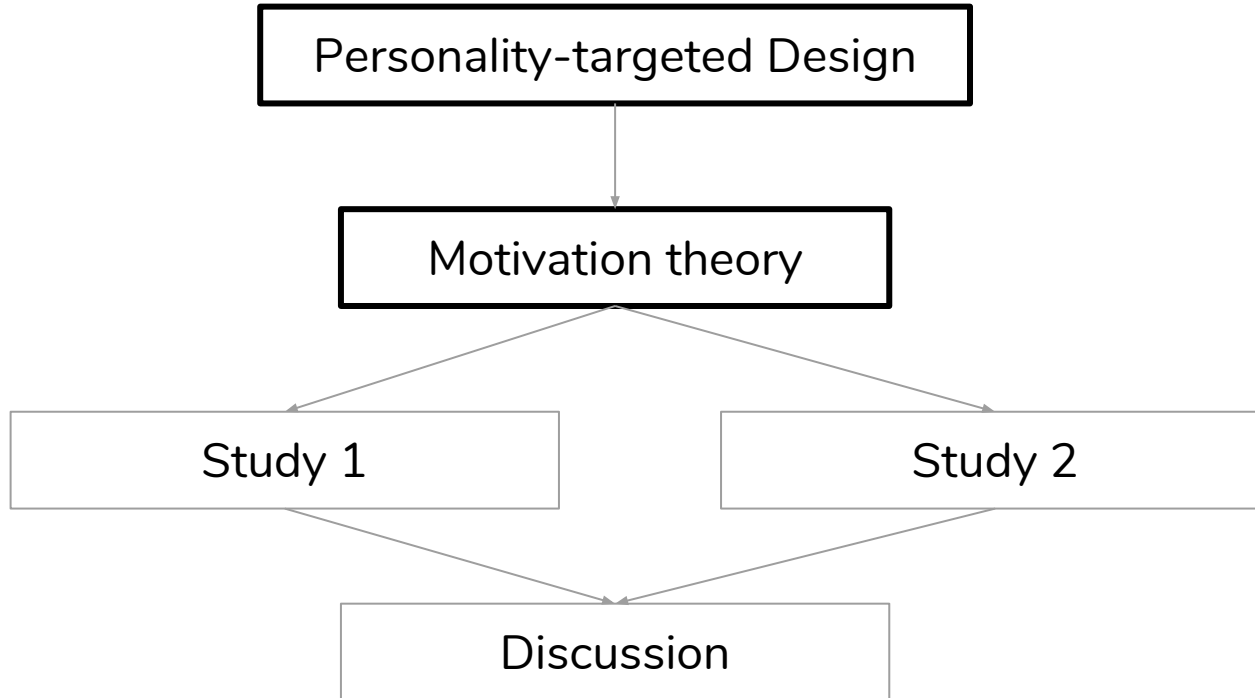


[Aitamurto & Saldivar 2017]

Research Question

Can
motivation-supportive design,
especially when personalized,
increase participation
in a crowd-civic system?

Approach: Theory-based Interface Design



Personality-targeted Design

UI personalized to match a user's *personality*



Moon 2002, Nov & Arazy 2013, Jia et al. 2016

Self-Determination Theory (SDT)

Motivational orientations = lasting aspects of one's personality

How task, environment, and user factors affect motivation differences

Gradient of Self-Determination and Autonomous Motivation

Amotivation

Extrinsic Motivation

Intrinsic
Motivation



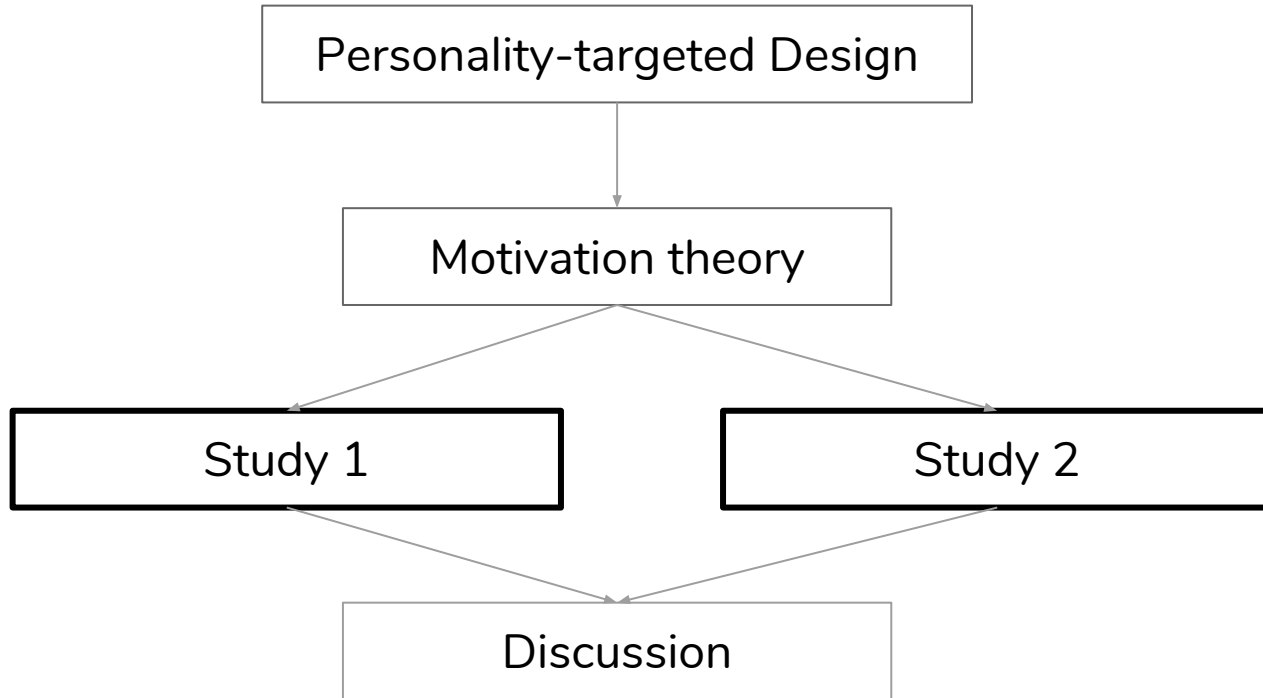
Less self-determined

Less autonomous

More self-determined

More autonomous

Simplified excerpt from Figure “Taxonomy of human motivation” [Ryan 2000]



Two-part Investigation

Study 1: Online Survey

Self-reported preferences

Amazon Mechanical Turk
(N=150)

Paid

Study 2: Field Study

Engagement measures

KAIST members
(N=120)

Voluntary

Two-part Investigation

Study 1: Online Survey

Self-reported preferences

Amazon Mechanical Turk
(N=150)

Paid

Study 2: Field Study

Engagement measures

KAIST members
(N=120)

Voluntary

Design

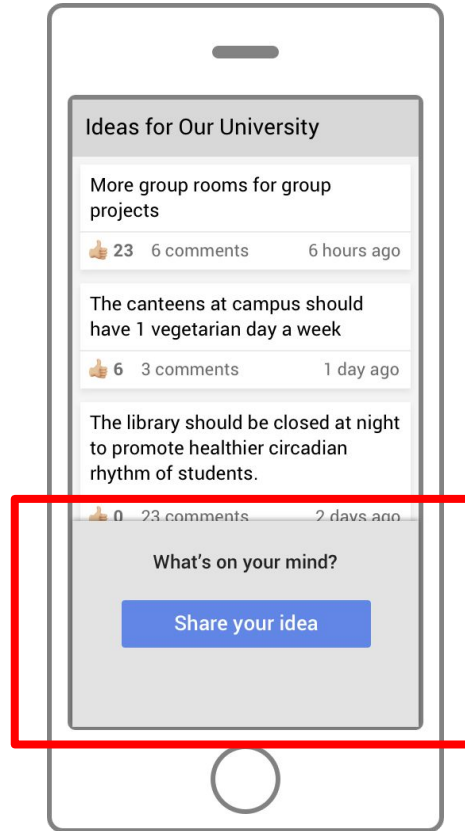


Image for baseline version.

Design Versions

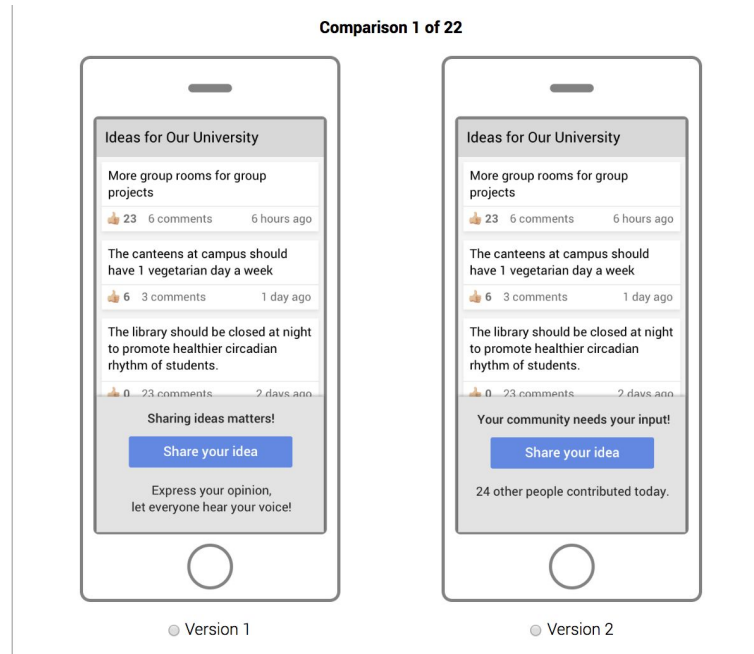
6 alternative versions
based on different concepts from SDT

Need for Autonomy	Need for Competence	Need for Relatedness
Autonomous orientation	Impersonal orientation	Controlled orientation

+ Baseline

Pairwise Comparison Survey

“In which version would you personally be more likely to contribute an idea?”



Next

Pairwise Comparison Survey

“In which version would you personally be more likely to contribute an idea?”

Sharing ideas matters!

Share your idea

Express your opinion,
let everyone hear your voice!

Version 1

Your community needs your input!

Share your idea

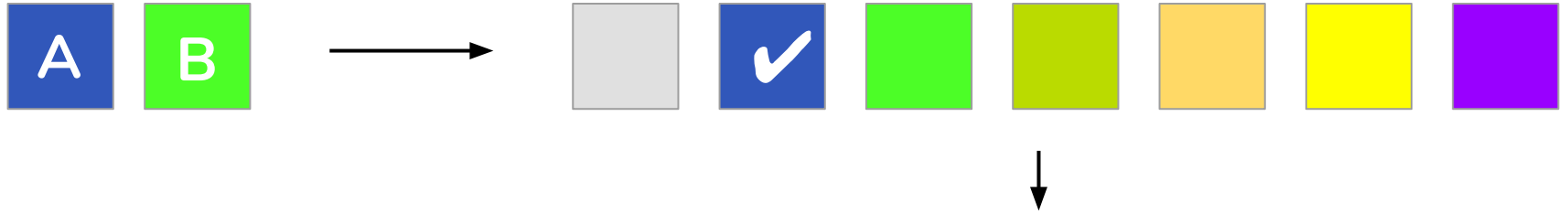
24 other people contributed today.

Version 2

Next

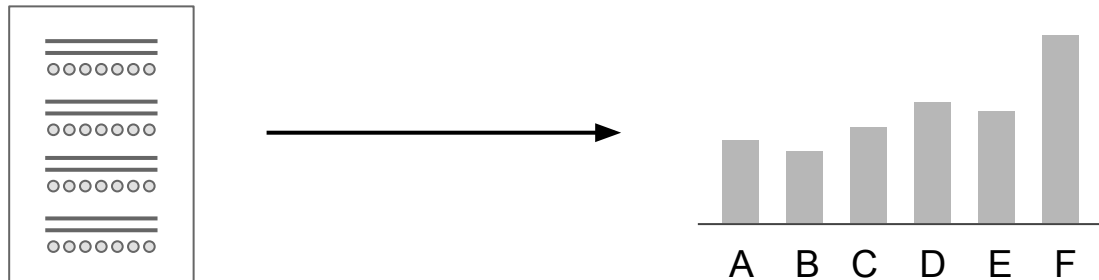
Data Collection (N=150)

1. Preferences

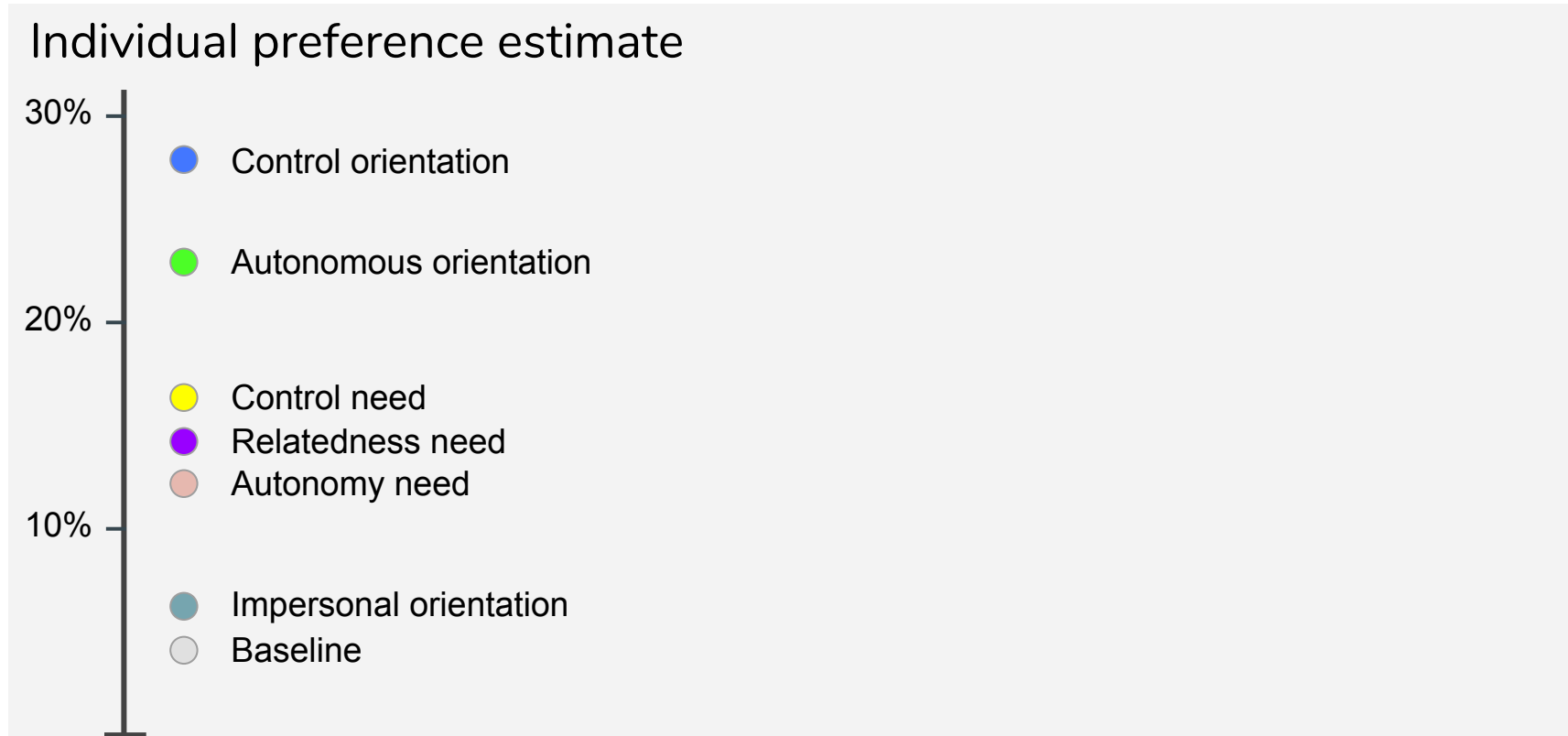


Why did you choose that?

2. Motivation questionnaires

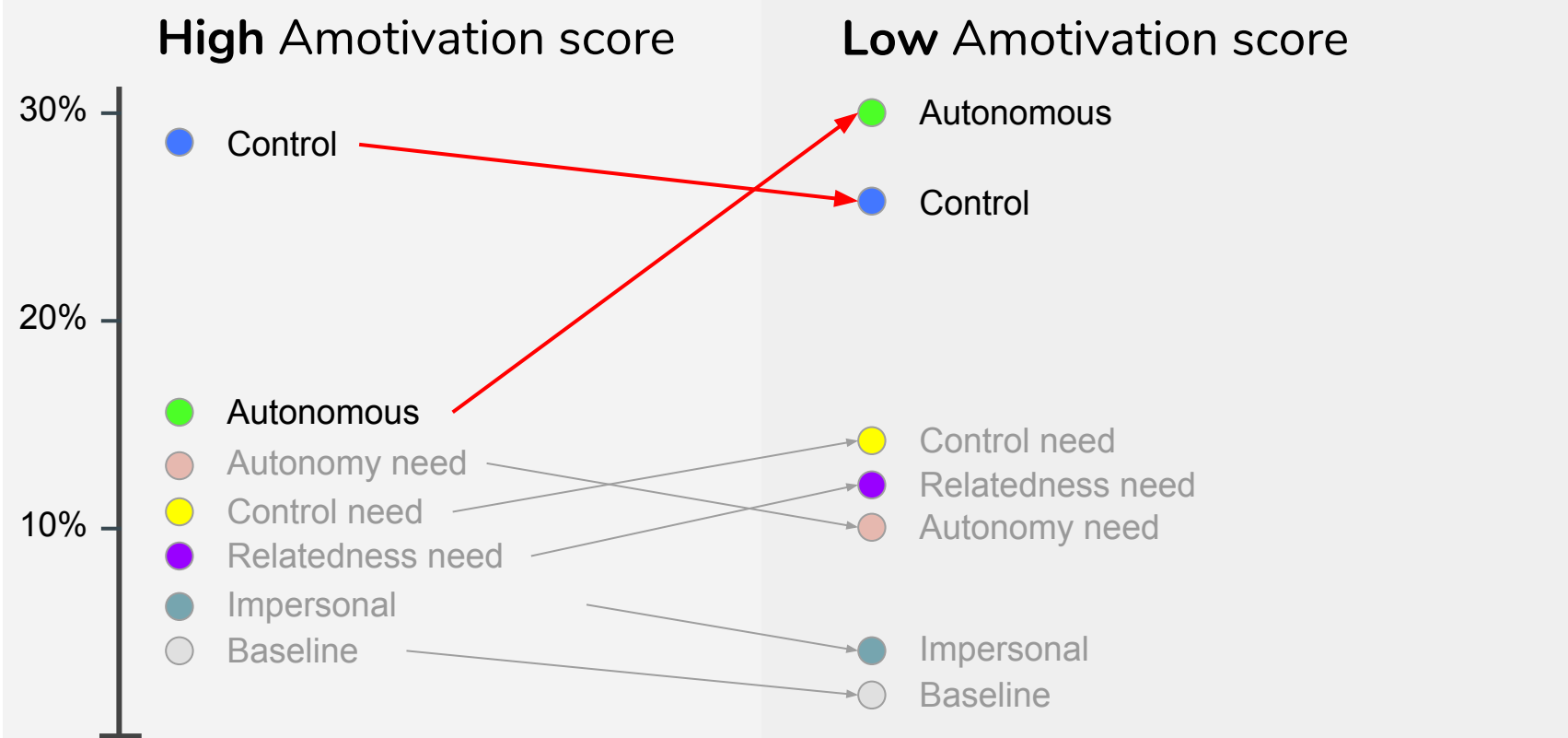


Participants have diverse preferences



Bradley-Terry Model worth estimates. ANOVA $p < 0.05$. N=99

Preferences correlate with motivation scores



Bradley-Terry Model worth estimates. Highlighted changes $p < 0.05$. N=99

Study 1 Limitations

Self-reporting (hypothetical bias)

Paid workers, possibly not representative of the general population

Two-part Investigation

Study 1: Online Survey

Self-reported preferences

Amazon Mechanical Turk
(N=150)

Paid

Study 2: Field Study

Engagement measures

KAIST members
(N=120)

Voluntary

KAIST Many Ideas



Join us in collecting important issues and ideas for the future of our university. We need everyone's contribution!

Sign up

Log in



RECENT IDEAS

Attach a 1000 W, 700 W label on the front (or side) of microwaves on campus

♡13 💬1

9 hours ago @akrso

Please eliminate the unnecessary advisor approval procedures

♡12 💬4

12 hours ago @kim

I wish there was an air purifier in every classroom

♡15 💬3

1 day ago @jeeeee

Shuttle bus time adjustment (+ extend on weekends)

♡9 💬2

1 day ago @moon

We need everyone's contribution!

Share your idea

6 other people contributed today.
Your ideas matter.



IDEA DETAILS

@jeeeee 1 day ago



I wish there was an air purifier in every classroom

I saw that the classrooms have a very high concentration of fine dust, but none of them have air purifiers. Do all the labs have them? It think there are many labs without air cleaners ...! I hope installation of air purifiers would increase.

♡15 💬3

Not just in the lecture rooms, I want to have air purifiers in the dorms as well. Corridors, toilet and shower windows are almost always open for ventilation. I use a mask when going out, but it is too troublesome to wear a mask every time I go to the bathroom or throw away garbage.

9 minutes ago

nya-ong

Let's share our diverse viewpoints!

Leave a comment

Treatment Conditions

Baseline

Autonomy
support

Control
support

Example for Different Motivation-supportive Messages

Baseline

< NEW IDEA

What is your idea to make KAIST a better place? It could be about facilities, organization, social problems, ...

What's your idea in one sentence?

Describe your idea in a bit more detail

Autonomy support

< NEW IDEA

What is your idea to make KAIST a better place? It could be about facilities, organization, social problems, ...

Let's have a real impact together! Among all ideas submitted until April 12th, we will hand-pick three promising ideas, present them to the whole school, and follow up with concrete steps to support their implementation!

What's your idea in one sentence?

Control support

< NEW IDEA

What is your idea to make KAIST a better place? It could be about facilities, organization, social problems, ...

Participation reward: Among all contributors until April 12th, we will randomly select 10 members to win \$20.

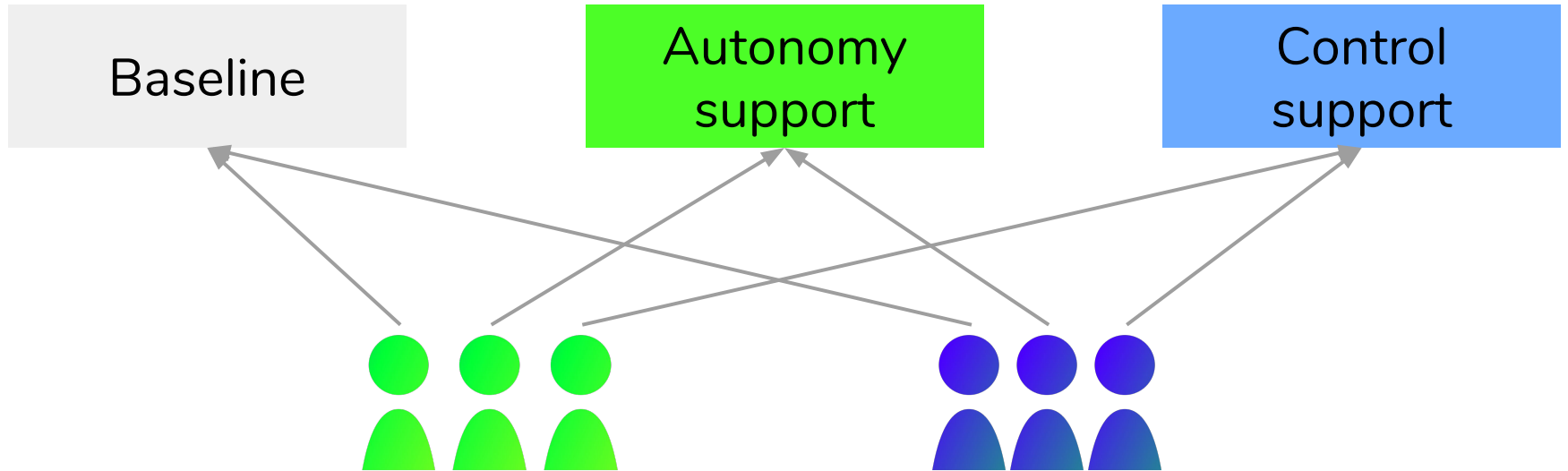
What's your idea in one sentence?

Describe your idea in a bit more detail

3 different versions for “New Idea” screens.

Study 2 30

Treatment Conditions



Personalization

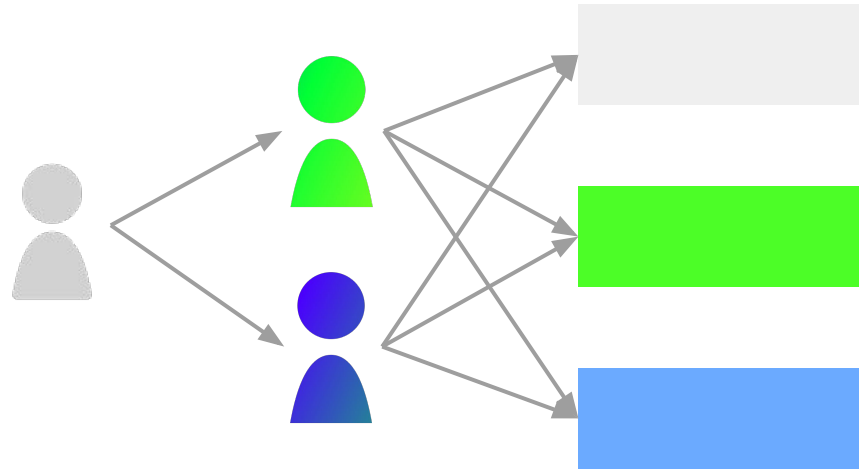
Method

Open-call recruitment

Signup group assignment

Engagement measures

Post-survey



Results

Users

120

Ideas

72

Comments

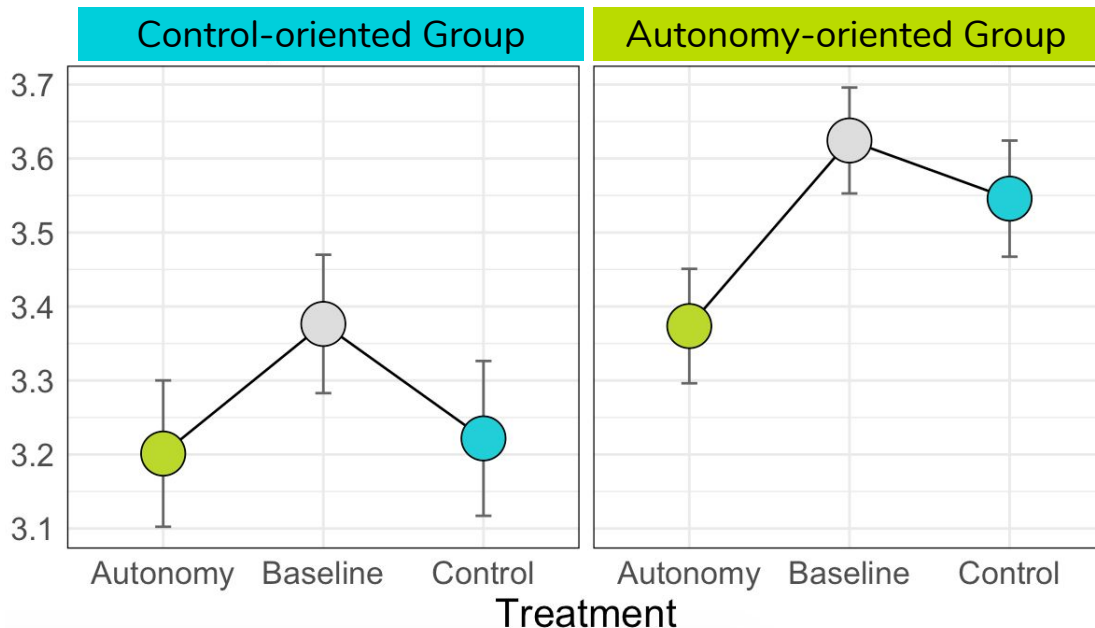
62

Likes

357

No correlation between Treatment and Signup Group

Interaction count per user (N=114)



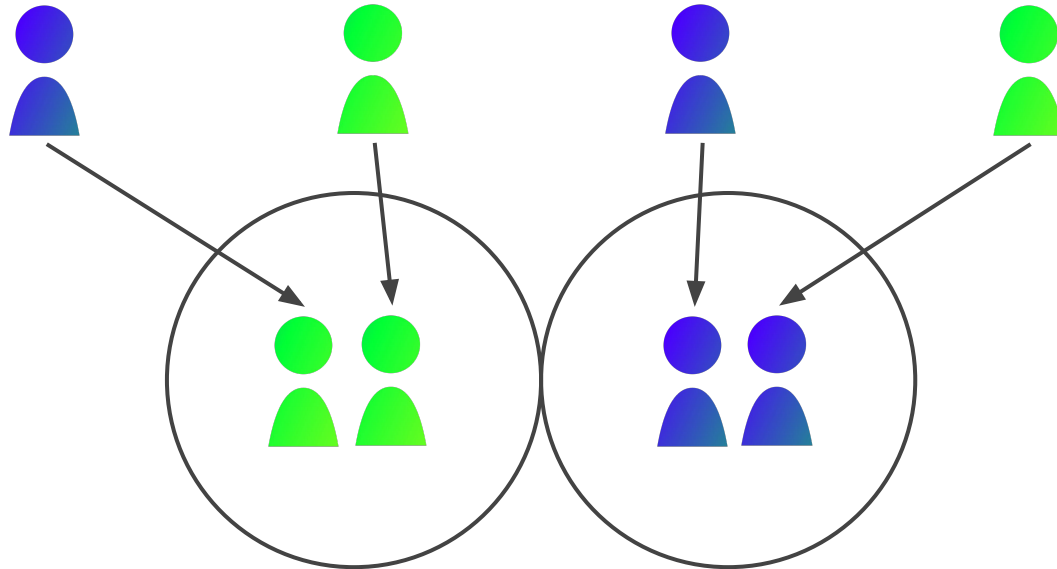
Least-squares means, GLM for Poisson distributed count data.

Observations on Personalization

Using a limited number of questions to classify turned out to be inaccurate.

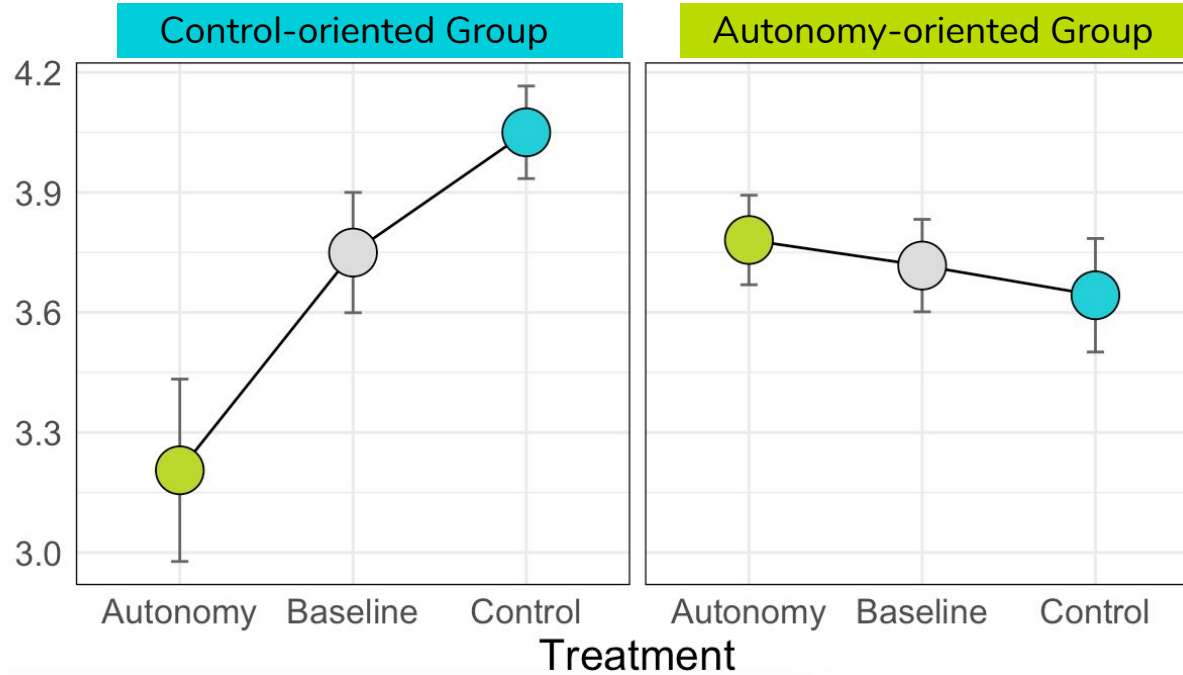
Post-hoc classification

→ Re-classify users based on post-survey full questionnaires (kmeans clustering).



Correlation between Treatment and Post-hoc Group

Interaction count per user (N=30)

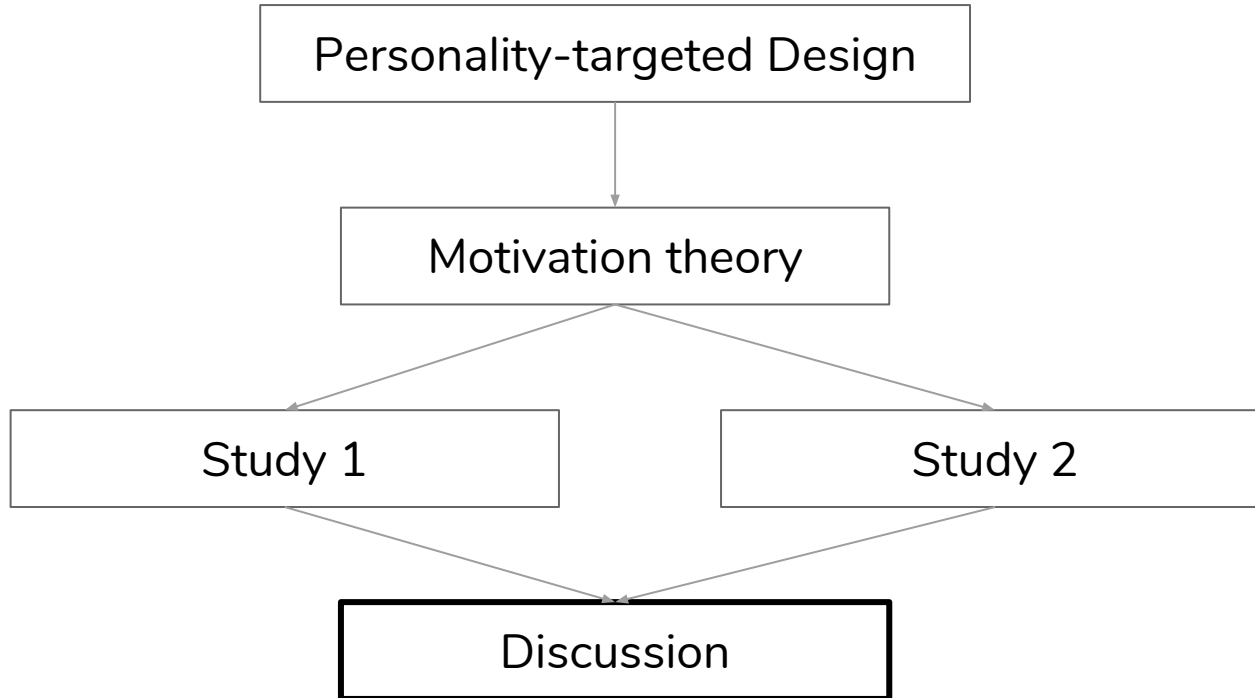


ANOVA for number of interactions $p < 0.01$ for treatment, group, and interaction;
Pair comparisons, Tukey method: left-hand side all $p < 0.01$, right-hand side n.s.

Study 2 Limitations

Small N for post-survey

Homogenous population (mostly Korean students)



Benefits and Challenges of Theory-based Design

SDT has proven to be a useful perspective for designing applications dealing with voluntary participation.

Translating theory to design is not an exact process.

Possibility of Personalization

Results show personalization is possible,
but need to improve automatic classification.

Trade-offs:

- explicit and implicit data elicitation

- potential adverse effects

- personalization and customization

Challenges of Field Study about Motivation

Advertising study without influencing motivation

How to track diversified (offline) recruitment?

Let's move away from “one size fits all”
by designing with diverse populations’
motivations in mind.

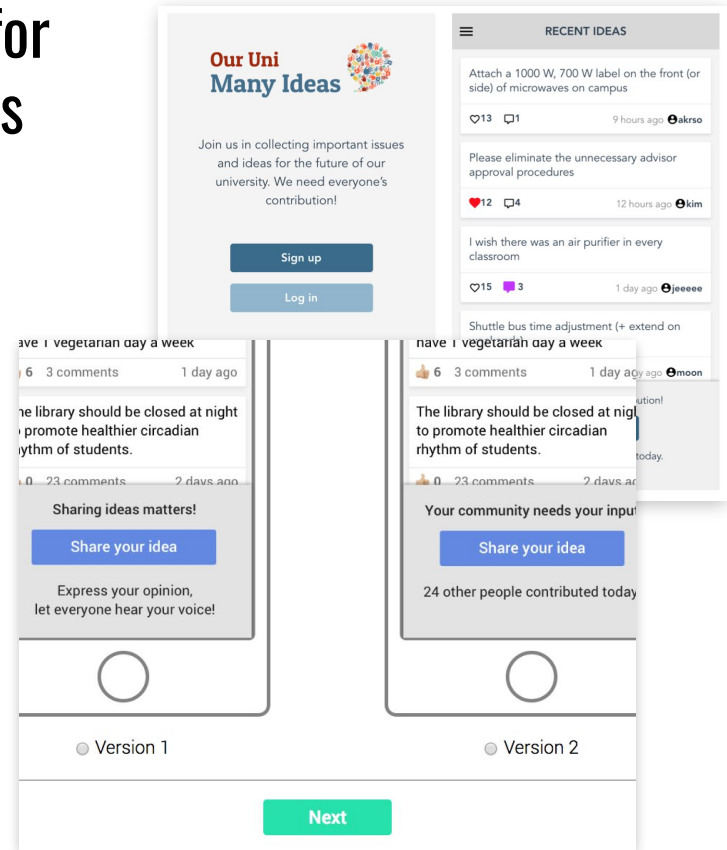
Personalized Motivation-supportive Messages for Increasing Participation in Crowd-civic Systems

1. Survey: motivation orientation differences can explain individual preferences for different motivation-supportive designs.
2. Field study: some tangible effects on actual participation but surfaced tradeoffs.
3. Combination of studies can give a more complete picture.

Open-source app and survey code:
<http://github.com/graup/manyideas>

Paul Grau

paul@graycoding.com
Twitter: @graycoding



References for slides

[Aitamurto 2016] Tanja Aitamurto and H  l  ne Landemore. Crowdsourced deliberation: The case of the law on offroad traffic in Finland. *Policy & Internet*, 8(2):174–196, 2016.

[Aitamurto 2017] Tanja Aitamurto and Jorge Saldivar. Motivating participation in crowdsourced policymaking: The interplay of epistemic and interactive aspects. *CSCW '17*. ACM, 2017.

[Deci 1985] Edward L Deci and Richard M Ryan. The general causality orientations scale: Self-determination in personality. *Journal of research in personality*, 19(2):109–134, 1985.

[Grano 2008] Caterina Grano, Fabio Lucidi, Arnaldo Zelli, and Cristiano Violani. Motives and determinants of volunteering in older adults: An integrated model. *The International Journal of Aging and Human Development*, 67(4):305–326, 2008.

[Hsieh 2016] Gary Hsieh and Rafa  Kocielnik. You get who you pay for: The impact of incentives on participation bias. *CSCW '16*. ACM, 2016.

[McInnis 2017] Brian McInnis, Alissa Centivany, Juho Kim, Marta Pobet, Karen Levy, and Gilly Leshed. Crowdsourcing law and policy: A design-thinking approach to crowd-civic systems. *CSCW '17*. ACM, 2017.

[Ryan 2000] Richard M Ryan and Edward L Deci. Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary educational psychology*, 25(1):54–67, 2000.

[Zinnbauer 2015] Dieter Zinnbauer. Crowdsourced corruption reporting: What petri ed forests, street music, bath towels, and the taxman can tell us about the prospects for its future. *Policy & Internet*, 7(1):1–24, 2015.

Appendix

Qualitative feedback is aligned with expectation

Controlled Orientation

Become a Contributor of the Month!

Share your idea

\$20 gift cards for Top 5 contributors.
Announcement on official website.

Preferred by 62%

A gift card is a **great incentive** for someone to participate.

The **chance of winning** makes me more compelled to participate and try harder.

Autonomous Orientation

Make our community a better place!

Share your idea

24 other people contributed today.
Your ideas matter.

14%

It looks more **friendly**.

Making things better for everyone sounds like the best plan overall.

Impersonal Orientation

Change may be beyond our control...

Share your idea

but there's a chance someone sees your idea and considers it.

3%

It doesn't try to make me feel **guilty** for not sharing an idea.

It's **honest**.

Baseline

What's on your mind?

Share your idea

7%

It's very **simple** and it **doesn't insult** the user by talking down to them.

Having motivational quotes makes the entire program seem less **serious**.

Measuring People's Underlying Motivation

General Causality Orientations Scale (GCOS) [Deci 1985]

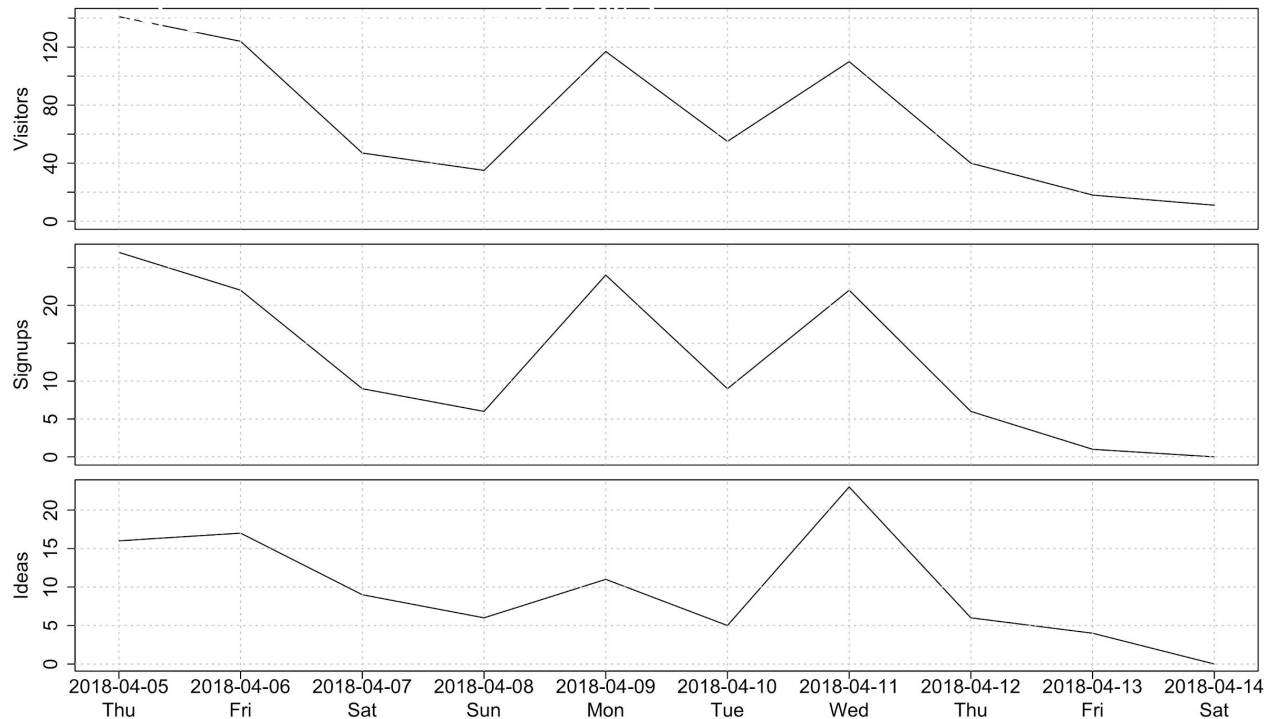
Autonomy, Control, Impersonal

Motivation to Volunteer Scale (MVS) [Grano 2008]

Amotivation, External regulation, Introjection,
Identification, Integration, Intrinsic

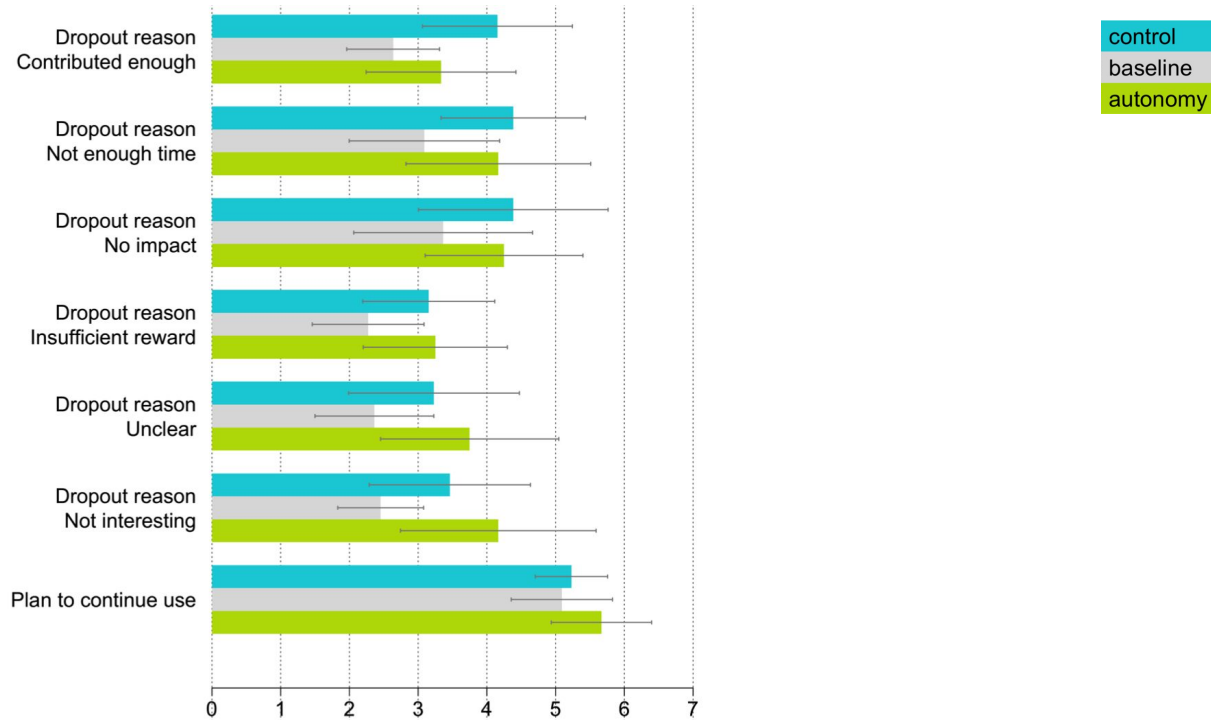
Overall participation

8 days, 120 users, 72 ideas, 62 comments, 357 likes



Detrimental Effects of Controlled Regulation

Post-survey data suggests additional effects.



카이스트

학식 메뉴

이것이 최선?

어떻게 해결하죠?

manyideas.org



위 URL을 방문하여
여러분의 좋은 아이디어를 공유해주세요.

**4월 12일까지 참여하고
다양한 선물을 받아주세요!**

카이스트 전산학부 KIXLAB에서 진행하는
"Participation for Social Good"에 관한 연구 프로젝트입니다.

문의 groa@kaist.ac.kr



자리도 너도

보이지 않는다

#교분사석화

어떻게 해결하죠?

manyideas.org



위 URL을 방문하여
여러분의 좋은 아이디어를 공유해주세요.

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문의 groa@kaist.ac.kr



교양

4개 신청

0개 당첨 실화?

어떻게 해결하죠?

manyideas.org



위 URL을 방문하여
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문의 groa@kaist.ac.kr



한국 최고 공대

인터넷 속도는...

(NFT) /

어떻게 해결하죠?

manyideas.org



위 URL을 방문하여

Future Work

Iterate on designs

- test more versions (esp. non-external-reward ones)

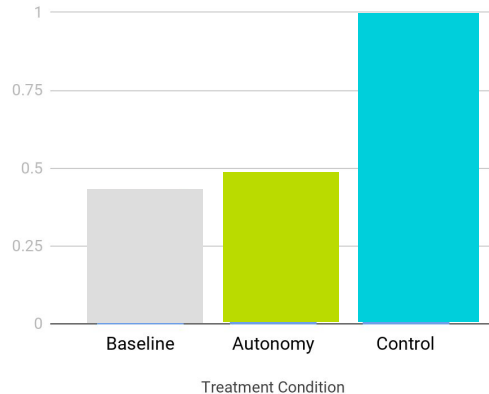
- test more affordances (not just messages)

More long-term field study with larger audience

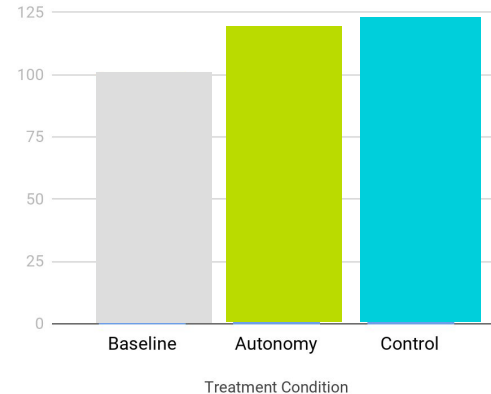
General Effectiveness of Control and Autonomous Motivation Strategies in Study 2

Both conditions increased engagement; Control significantly.

Ideas per user (N=120)



Characters per idea (N=120)



ANOVA $p < 0.01$; post-hoc multiple comparisons with Tukey method $p < 0.05$ for Control treatment compared to both other treatments; GLM for Poisson distributed count data.

ANOVA n.s.; LM with lognormal distributed data

Idea Curation

First author and one external rater from the Student Council

Criteria: Popularity + Originality + Feasibility + Depth + Discussion

**Fine Dust Mask Vending
Machine**

14 Likes, 3 comments

**Eliminate useless advisor
signature procedures**

13 Likes, 1 comment

**Please make a weekly
vegetarian day in the cafeteria**

5 Likes, 3 Comments

**Eoeundong-san Underground
Shopping Mall**

9 Likes, 4 Comments

Limitations and Alternatives for Message Personalization

Trade off: implicit/explicit elicitation, effort/benefit for user.

Can we get personality information automatically?

Privacy risks, ethical concerns, lack of autonomy?

Bradley-Terry model

Calculate probabilities for each version based on pairwise comparison data

Prefmod: R package that constructs matrix suitable for regression.

Reinhold Hatzinger, Regina Ditttrich, et al. Prefmod: An r package for modeling preferences based on paired comparisons, rankings, or ratings. *Journal of Statistical Software*, 48(10):1–31, 2012.

Questionnaire Examples

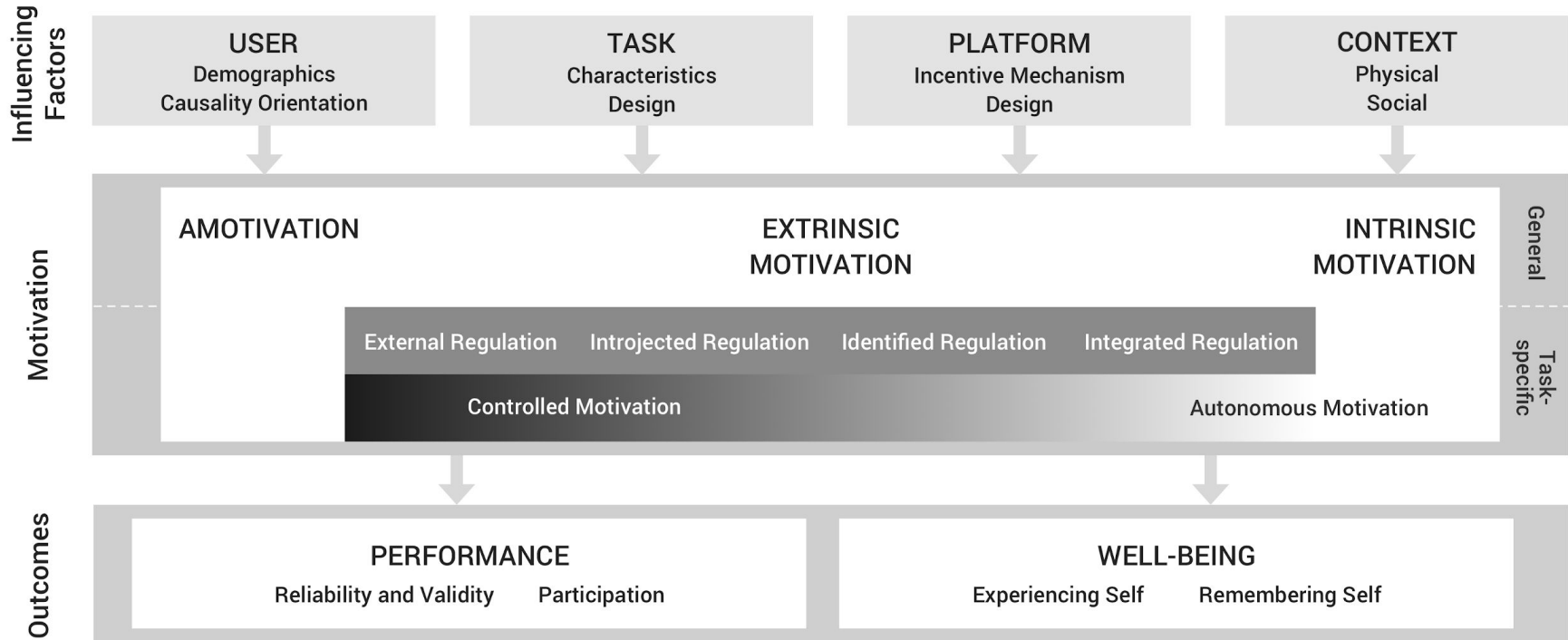
GCOS

You have been offered a new position in a company where you have worked for some time. The first question that is likely to come to mind is:

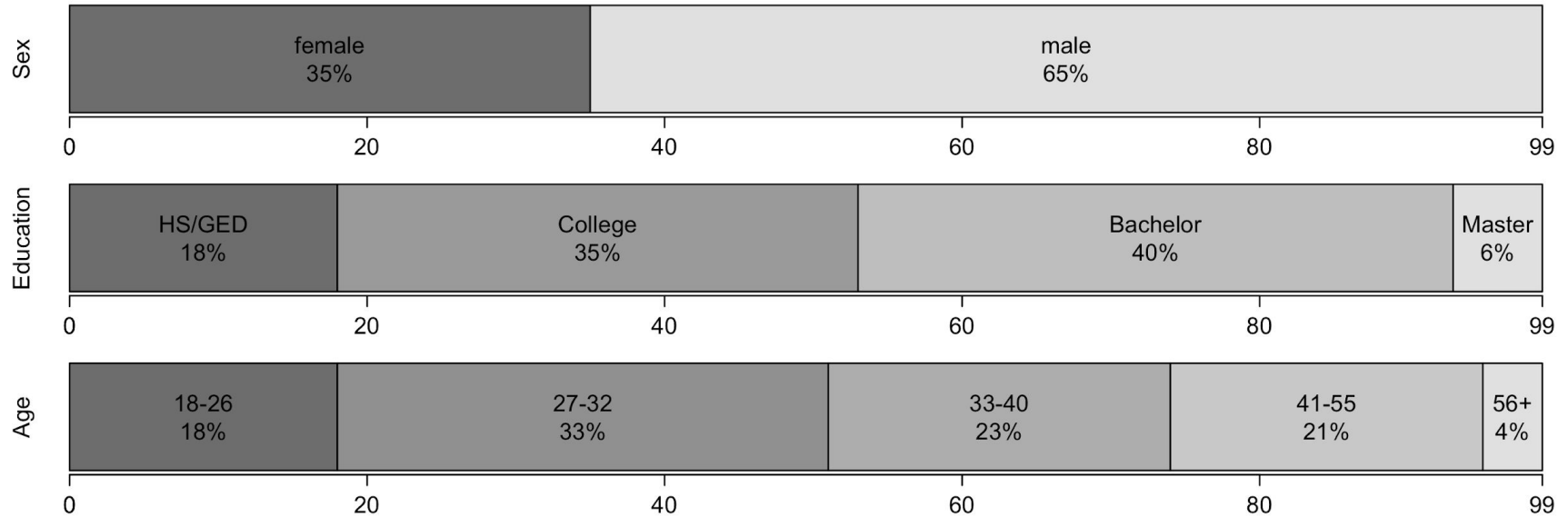
- 1) What if I can't live up to the new responsibility? (Impersonal)
- 2) Will I make more at this position? (Control)
- 3) I wonder if the new work will be interesting. (Autonomy)

MVS

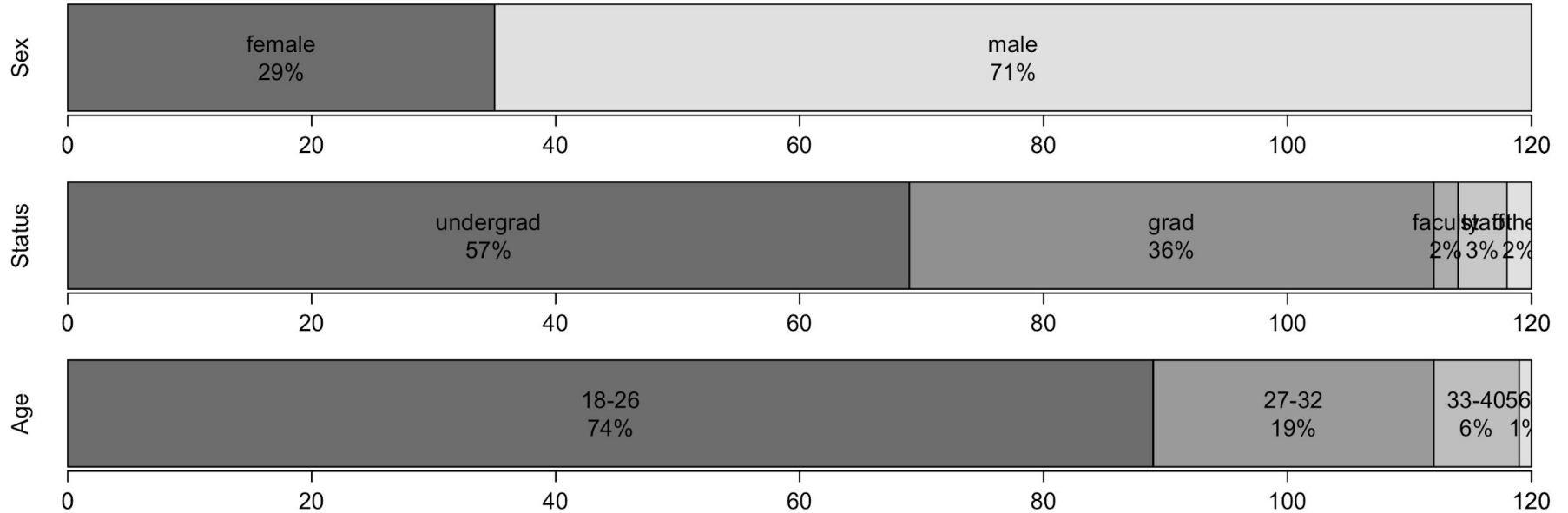
Taxonomy of Work Motivation



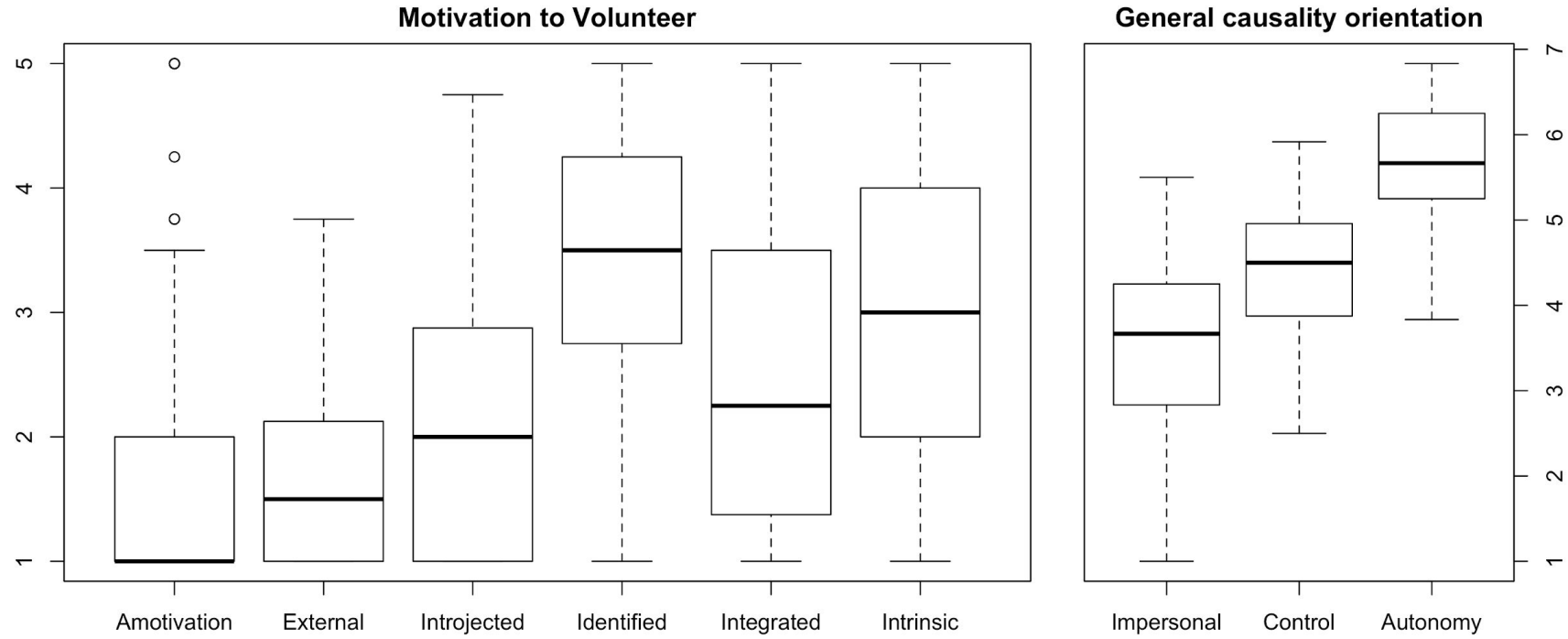
Study 1 Demographic Data (N=99)



Study 2 Demographic Data (N=120)

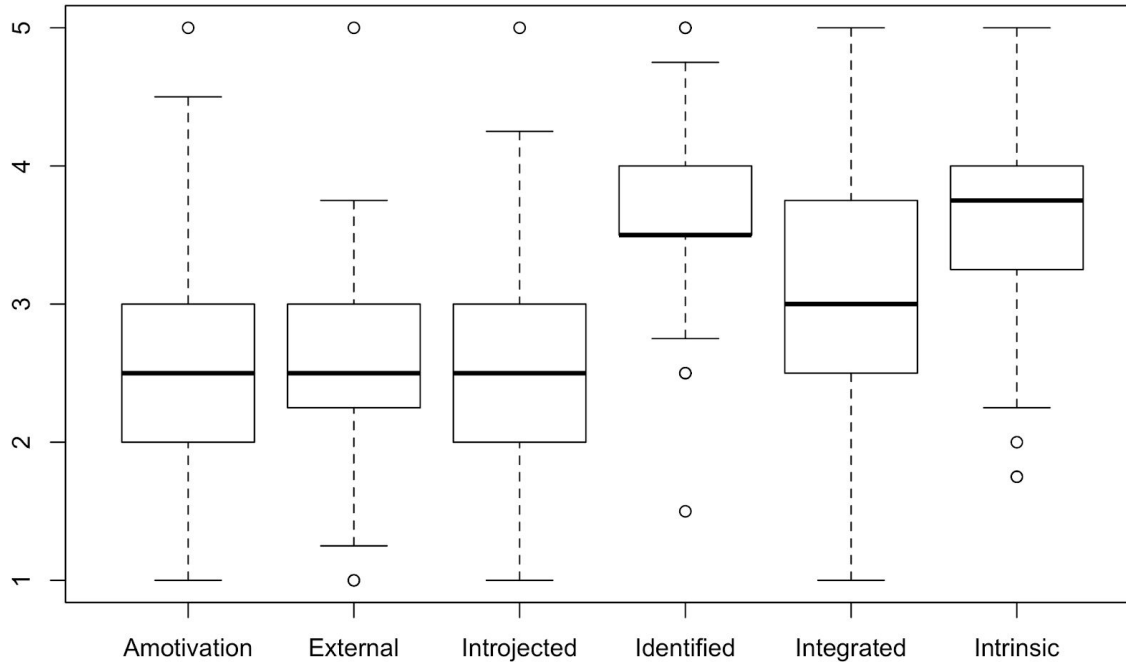


Study 1 Test Scores (N=99)

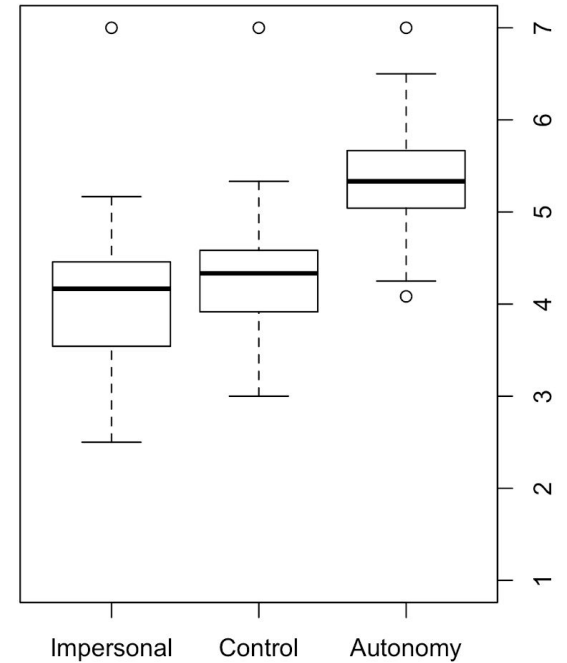


Study 2 Test Scores (N=38)

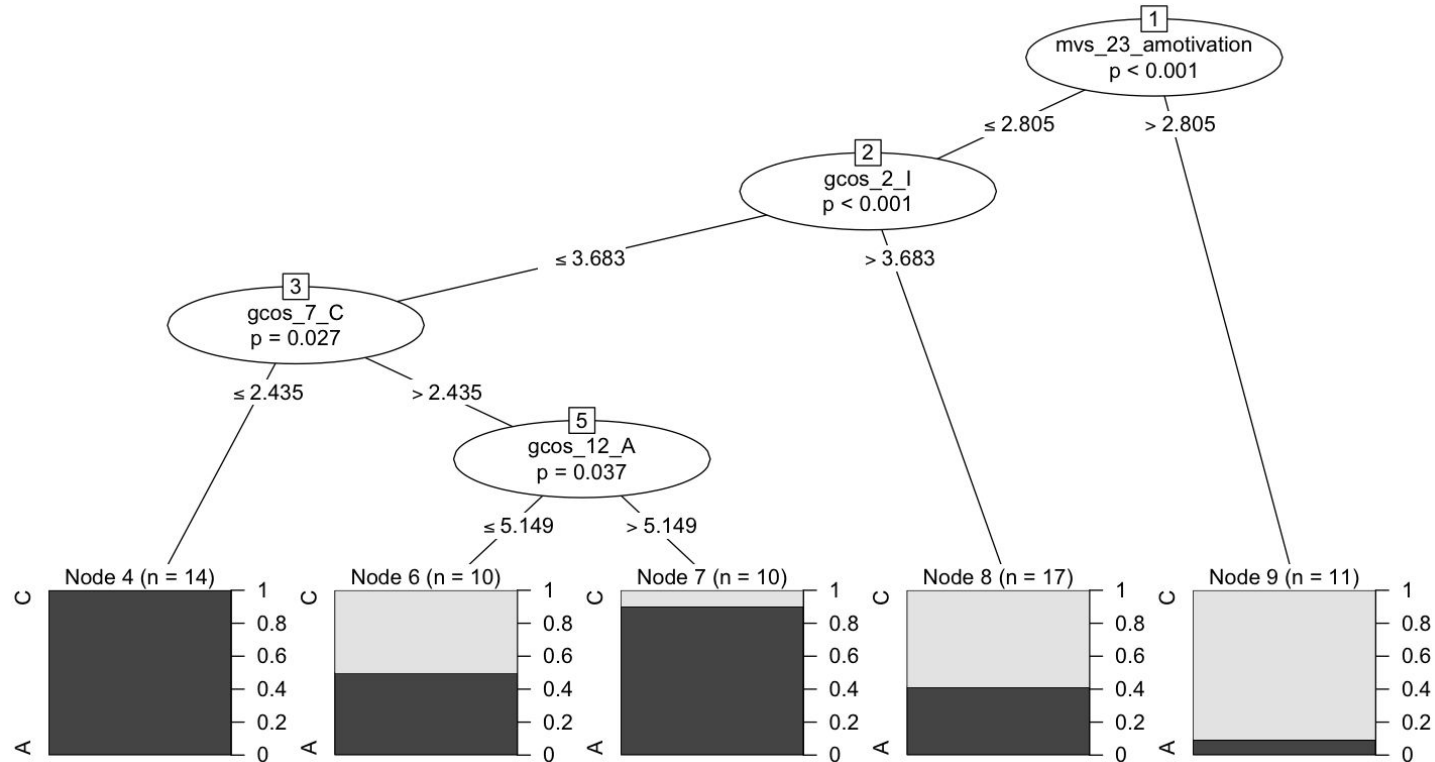
Motivation to Volunteer



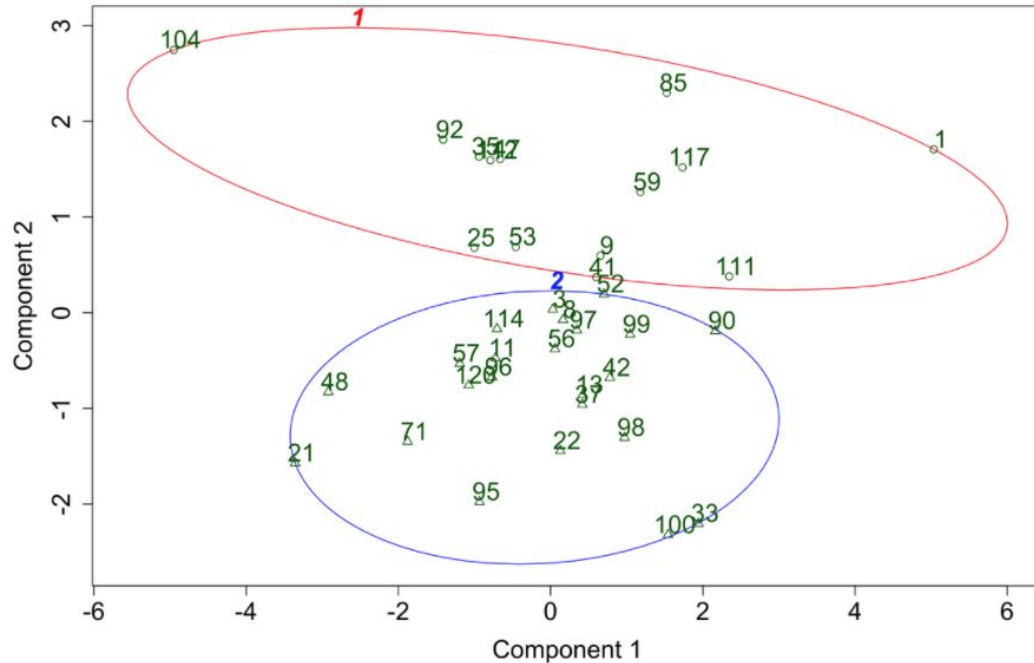
General causality orientation



Personalization Engine Decision Tree



Study 2 Post-hoc Clusters



Scale	Cl. 1	Cl. 2
Intrinsic	3.27	3.54
Integrated	3.10	3.15
Identified	3.04	3.76
Introjected	3.35	2.33
External	3.27	2.40
Amotivation	3.55	1.99