Acceptance of the Artificial Pancreas: Comparing the Effect of Technology Readiness, Product Characteristics and Social Influence between Invited and Self-Selected Respondents

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BACKGROUND

- Human factors that may affect acceptance of artificial pancreas (AP) systems have been investigated in small samples of highly motivated, self-selected persons with type 1 diabetes (T1DM) with a focus on product characteristics.
- A robust and standardized questionnaire to investigate the effect of human factors on AP acceptance is lacking.

Aims

- To investigate the impact of technology readiness, product characteristics and social influence on AP acceptance in a larger sample, including both self-selected and invited respondents with T1DM.
- To develop a reliable and valid questionnaire.

METHODS

Subjects

- Self-selected group: convenience sample of 601 persons with T1DM from >3000 persons who had indicated their wish to participate in scientific research into the AP on the website of Inreda Diabetic (Goor, The Netherlands).
- Invited group: 270 persons with T1DM listed using insulin pump therapy at the Rijnstate Hospital (Arnhem, The Netherlands).

Survey

- Intention to use the AP was chosen as measure of AP acceptance.
- The variables (Table 1) were grounded in well-established theories: the Technology Readiness Index [1], the Technology Acceptance Model [2], Innovation Diffusion Theory [3] and Theory of Planned Behavior [4].
- Questions were answered on a 7-point Likert scale (1 to 7).
- Score per variable were calculated as mean of the questions.
- Also information about demographics, current diabetes treatment, and the satisfaction with the current treatment (Diabetes Treatment Satisfaction Questionnaire [5]) was collected.
- The introduction to the questionnaire described and showed the AP system of Inreda Diabetic [6].

Measured variables with the number of questions and Cronbach's α

Table 1	Variable	Nr. of questions	Cronbach's α
Technology readiness [1]	Optimism	6	.866
	Innovativeness	5	.886
	Discomfort	5	.792
	Insecurity	7	.814
Product characteristics [7]	Usefulness	6	.906
	Compatibility	3	.854
	Complexity	4	.893
Social influence [7]	Social influence	2	.819
Acceptance [2]	Intention to use	2	.895

RESULTS

Baseline characteristics

- The survey was completed by 425 self-selected persons (response rate: 69.7%) and 109 invited persons (response rate: 42.2%).
- Compared to the self-selected respondents, the invited respondents were older, had diabetes for a longer period, were more satisfied with their treatment, perceived less frequently hyperglycemia and more often used insulin pump therapy.

Comparison of the variables between self-selected and invited respondents

Table 2	Self-selected respondents	Invited respondents	p-value
Optimism	5.90 ± 0.86	5.61 ± 1.00	.007
Innovativeness	4.99 ± 1.24	4.66 ± 1.40	.025
Discomfort	2.97 ± 1.21	2.86 ± 1.16	.397
Insecurity	3.13 ± 0.97	3.18 ± 0.89	.671
Perceived usefulness	6.06 ± 0.84	5.66 ± 1.04	<.001
Compatibility	6.21 ± 0.85	5.88 ± 1.14	.006
Complexity	2.13 ± 1.04	2.31 ± 1.06	.129
Social influence	4.95 ± 1.66	4.66 ± 1.65	.105
Intention to use	6.49 ± 0.82	6.10 ± 0.99	<.001

Data are mean ± SD. Independent t-tests, two-tailed.

Relationship between the variables and the intention to use the AP

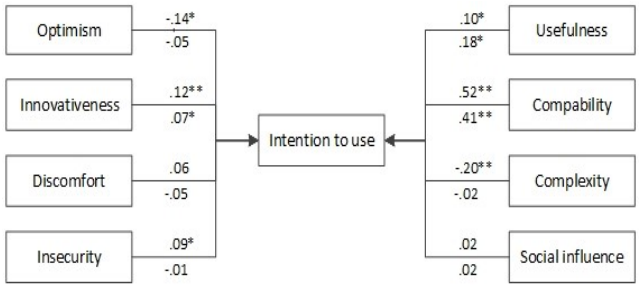

Figure 1. Multiple regression with intention to use as dependent variable for invited (above the line) and self-selected (below the line) respondents separately. Data represent standardized β, *p < .05, **p < .001.

CONCLUSIONS

- Product characteristics have a larger impact on AP acceptance than technology readiness, while social influence does not seem to impact AP acceptance.
- As the (strength of) influencing factors differ between self-selected and invited persons, researchers and product developers should be cautious when relying on self-selected persons with T1DM in the design, development, and testing of AP systems.
- A valid and reliable questionnaire to measure AP acceptance and potentially explanatory factors was developed.

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Funding: European Commission FP7 grant 305654

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