

# Smart VitAALity – Effects of a modular AAL system on subjective quality of life. Methods and first results

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## Background

Gerontechnologies have the potential to contribute to a good life in old age as long as they support the coping with age-specific challenges and development tasks and are adapted to the individual life goals of the respective person (Remmers, 2016; Schulz et al., 2015). Hence, assistive technologies shall be obliged to the primary goal of minimizing losses and maximizing gains (Lindenberg & Lövdén, 2006). However, the evidence for the assumed positive effects of such “quality of life technologies” (Schulz et al., 2015) is considerably low, inter alia, due to methodological limitations of previous studies (e.g. small samples, lack of controlled studies), the lack of theory-based development and evaluation processes and the heterogeneity of the technical solutions evaluated so far (Khosravi & Ghanpanchi, 2016).

## Research question

The present study investigated in the effects of a modular but individually combinable AAL system (a technology bundle consisting of modern communication and information technologies such as Smart Watch and Tablet, sensor technology and measuring devices for recording vital parameters; for a detailed description see Ströckl et al., 2019) on the subjective quality of life (primary outcome) in a comparatively large sample of older people (mean age 69.6 ± 6.61 years).

## Sample and Method

The present study was conducted as a controlled before-after (CBA) study. In favor of realizing a large sample size, potential study participants were specifically addressed either for the intervention or control group. The study participants in the Smart VitAALity project were senior citizens living in Carinthia in the three cities Ferlach, Klagenfurt and Villach (urban triangle). At the beginning a total of  $N = 226$  (T1) people participated in the Smart Vitality study and completed the *sqol* measures. At this point,  $n = 103$  people belonged to the intervention group and  $n = 123$  people to the control group. The study was completed by a total of  $N = 221$  (T2) study participants. At this point,  $n = 100$  people were in the intervention group and  $n = 121$  people in the control group. In total there were two times of measurement were the *sqol* has been investigated, one before the intervention phase started (2018) and one after the 12-month intervention phase was completed (2019).

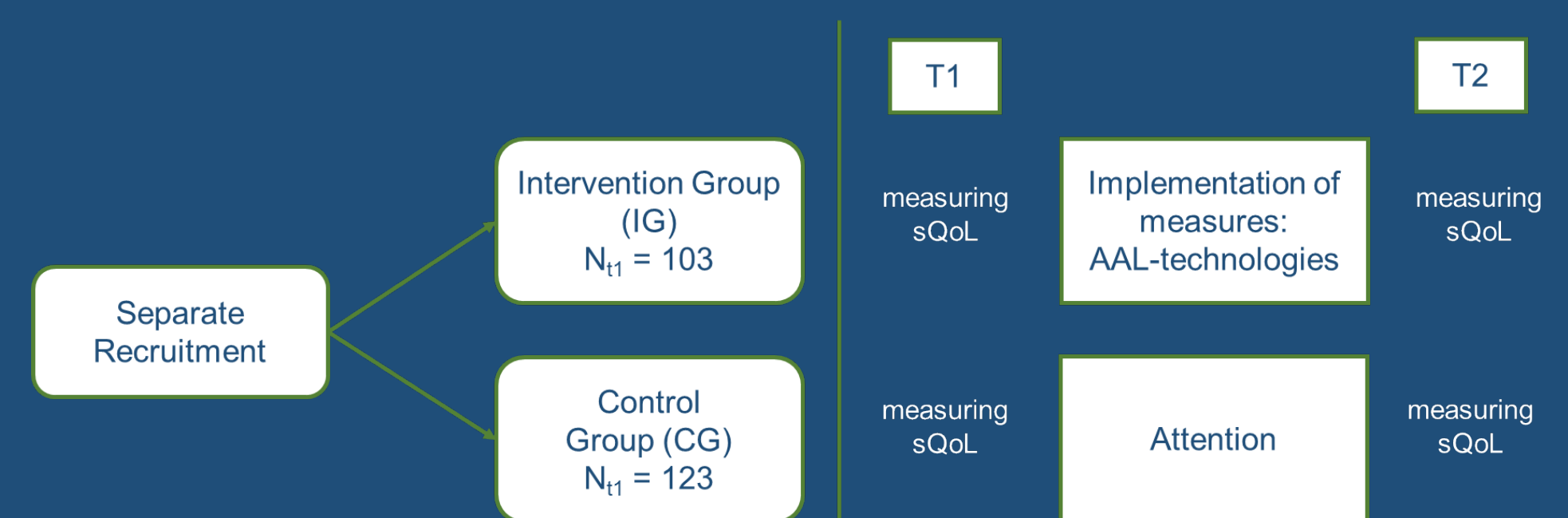


Figure 1: Study Design

Quality of life does not represent a single outcome, but has to be captured over several dimensions relevant to the respective context (Fletcher et al., 1992). Therefore the questionnaire contained several established instruments for measuring the dimensions of quality of life. The applied instruments were the WHOQOL-OLD (Conrad et al., 2016) with 6 different facets (sensory functions, autonomy, activities in the past, present and future, social participation, fears and anxieties about death and dying, intimacy), the WHOQOL-BREF (Conrad et al., 2016) with a total of four dimensions (physical quality of life, mental quality of life, social relationships, environment) and a global score, the short form of the Social Support Questionnaire (F-SozU-K14; Fydrich et al., 2009) which measured the emotional and practical support as well as social integration, and the HPEAS<sub>KD</sub> (Hertz Perceived Enactment of Autonomy Scale; Wulff et al., 2012) which was used to measure the subjectively perceived autonomy. In accordance with the project aim, only self-evaluation instruments were used. Furthermore, technology affinity as a potential confounder was assessed using the TA-EG (Karrer et al., 2009).

## Results

Concerning the equivalence of the two groups, no significant differences could be revealed regarding age,  $z = -1.016$ ,  $p = .309$ , gender,  $X^2(N=226, df = 1) = 0.548$ ,  $p = .459$ , level of care (care level 0: 93.5% vs. 94.2%), and technical affinity (excitement:  $t(df = 228) = 0.717$ ,  $p = .474$ , positive attitude:  $t(df = 229) = 0.652$ ,  $p = .515$ , negative attitude:  $t(df = 229) = -1.809$ ,  $p = .072$ ), except for one sub-scale (competence:  $t(df = 228) = -2.211$ ,  $p = .028$ ). A larger proportion of participants of the intervention group vs. control group lived alone,  $X^2(N= 226, df= 1) = 4.345$ ,  $p = .037$ .

Table 1. Descriptive Statistics

	Pre-Test		Post-Test	
	IG	CG	IG	CG
	M(SD)	M(SD)	M(SD)	M(SD)
WHOQOL-BREF				
Physical QoL	74.1 (16.49)	78.4 (17.92)	74.9 (17.05)	77.3 (19.40)
Mental QoL	75.6 (13.14)	78.5 (15.02)	75.3 (13.25)	78.0 (15.41)
Social Relationships	72.1 (15.97)	73.0 (19.60)	74.8 (14.46)	72.0 (20.09)
Environment	81.8 (10.95)	83.7 (13.19)	82.0 (12.63)	84.4 (13.36)
Overall	72.3 (17.10)	77.6 (19.23)	72.3 (17.64)	74.9 (19.28)
WHOQOL-OLD				
Sensory Functions	76.5 (19.15)	82.8 (18.59)	74.9 (18.93)	82.5 (19.32)
Autonomy	75.7 (15.12)	77.3 (16.17)	76.4 (14.62)	79.1 (15.47)
Activities	73.7 (14.89)	74.3 (16.51)	74.6 (14.92)	74.6 (16.20)
Social Participation	76.4 (15.94)	80.1 (16.46)	77.1 (15.79)	77.9 (17.97)
Fear of Death	70.1 (24.95)	70.8 (22.49)	69.2 (22.97)	70.7 (22.12)
Intimacy	74.5 (19.51)	75.3 (21.02)	75.2 (17.68)	76.1 (19.27)
Overall	74.5 (11.50)	76.79 (13.01)	74.6 (11.47)	76.8 (13.31)
FSOZU	4.2 (0.84)	4.2 (0.70)	4.2 (0.58)	4.2 (0.73)
HPEAS	2.9 (0.42)	3.0 (0.45)	2.9 (0.45)	2.9 (0.50)

Table 1: Descriptive Statistics

Source	Sum of Squares	df	Mean Square	F	p
Social Relationships					
time	79.308	1	79.308	0.823	.365
group	84.972	1	84.972	0.155	.694
time*group	364.731	1	364.731	3.785	.053
Error	20816.302	216	96.372		

Table 2: 2-way ANOVA: WHOQOL-BREF domain: social relationships

Source	Sum of Squares	df	Mean Square	F	p
Sensory Functions					
time	100.038	1	100.038	1.020	.314
group	5303.949	1	5303.949	8.485	.004
time*group	50.796	1	50.796	0.518	.472
Error	21372.460	216	98.030		

Table 3: 2-way ANOVA: WHOQOL-OLD: sensory functions

Source	Sum of Squares	df	Mean Square	F	p
Perceived Autonomy					
time	0.244	1	0.244	4.175	.042
group	0.468	1	0.468	1.303	.255
time*group	0.001	1	0.001	0.025	.876
Error	12.170	208	0.059		

Table 4: 2-way ANOVA: HPEAS<sub>KD</sub> – perceived autonomy

As shown in table 1, the mean values of all scales do not significantly differ between the groups and within the points in time, which means that there are no significant interactions evident. However, for the scale *social relationships*, a marginally significant interaction could be revealed (see table 2; figure 2). In addition, a major group effect on the *sensory functions* scale was revealed, with higher values for the control group (see table 3; figure 3) whereas *perceived autonomy* decreased over time in both groups (see table 4; figure 4).

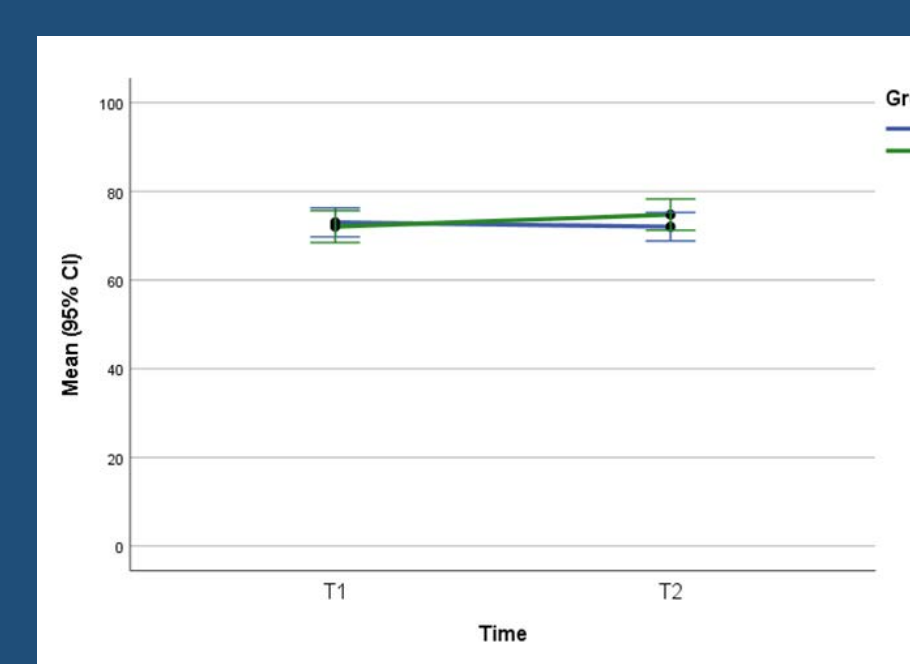


Figure 2: WHOQOL-BREF domain: social relationships

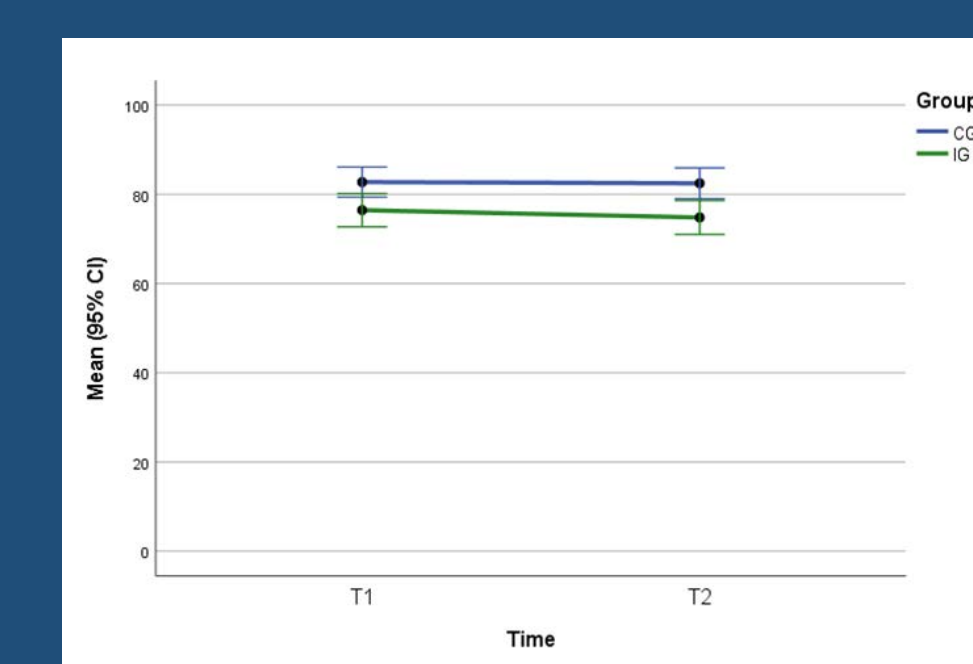


Figure 3: WHOQOL-OLD: sensory functions

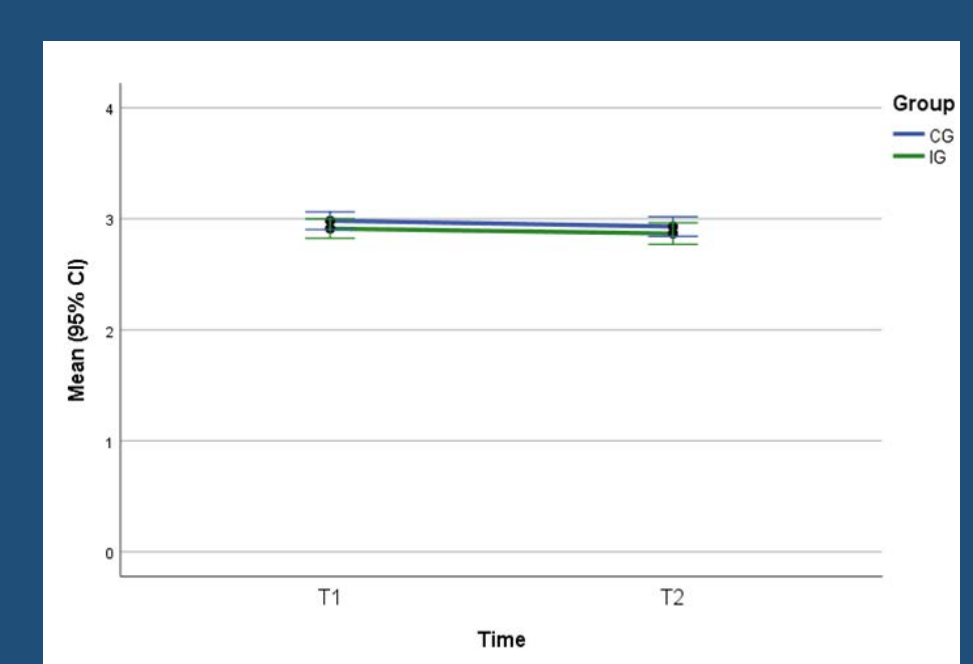


Figure 4: perceived autonomy

## Discussion

First data analyses do not show any effects of the intervention on the subjective quality of life. However, a marginally significant interaction (*social relationships* scale) could be revealed. Control group participants scored higher on *sensory functions*, while *perceived autonomy* as measured using the HPEAS<sub>KD</sub> decreased slightly over time in both groups. A possible explanation for the absence of interactions could be that both groups, intervention group and control group, showed quite high values (above the norm) and hence no further improvement was possible in the observed time period. Another explanation for the missing intervention effects could be response shift (Sprangers et al., 1999; results reported elsewhere). However, in order to further develop the evidence in this field of research, it is important that future studies are carried out using randomized controlled trials and observing long-term effects. With regard to the present study, currently further explanatory analysis (per protocol) are in progress.

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