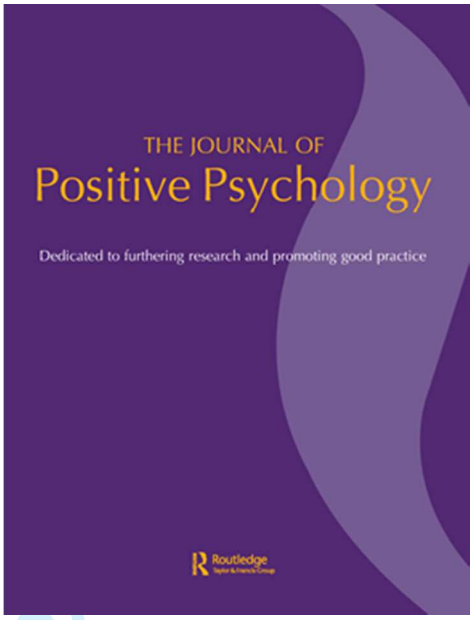
Título artículo / Títol article:	EARTH of Well-Being System: A pilot study of an Information and Communication Technology-based positive psychology intervention
Autores / Autors	Baños Rivera, Rosa María ; Etchemendy, Ernestina ; Farfallini, Luis ; García Palacios, Azucena ; Quero Castellano, Soledad ; Botella Arbona, Cristina
Revista:	The Journal of Positive Psychology Volume 9, Issue 6, 2014
Versión / Versió:	Preprint de l'autor
Cita bibliográfica / Cita bibliogràfica (ISO 690):	BAÑOS, Rosa María, et al. EARTH of Well-Being System: A pilot study of an Information and Communication Technology-based positive psychology intervention. The Journal of Positive Psychology, 2014.
url Repositori UJI:	http://hdl.handle.net/10234/129692



'EARTH of Wellbeing': using technology to promote positive

Journal:	*The Journal of Positive Psychology*
Manuscript ID:	Draft
Manuscript Type:	Special Issue Paper
Date Submitted by the Author:	n/a
Complete List of Authors:	Baños Rivera, Rosa María; University of Valencia, ; CIBERobn, Etchemendy, Ernestina; CIBERobn, Farfallini, Luis; University Jaume I, García-Palacios, Azucena; University Jaume I, ; CIBERobn, Quero, Soledad; University Jaume I, ; CIBERobn, Botella, Cristina; University Jaume I, ; CIBERobn,
Keywords:	positive emotions, subjective well-being
Keywords (author supplied):	Positive Technology, Virtual Reality, Information and Communication Technologies, Mood Induction Procedures, Positive Psychology Interventions

Title: 'EARTH of Wellbeing': using technology to promote positive

ABSTRACT

Positive Technology field combines the objectives of Positive Psychology with enhancements of Information and Communication Technologies (ICTs). Following this approach, our team has developed 'EARTH of Wellbeing', a system addressed to induce and train positive emotions and enhance different psychological strengths trough self-applied positive psychology interventions. This paper presents a description of the system, analyzes its efficacy to increase positive mood, and offers data about the users' satisfaction. The sample was composed of 38 volunteers who used the application 6 sessions along 2 weeks. Results show that participants increased their positive mood and decreased their negative emotions in all sessions. Besides, high levels of satisfactions were reported. Results support the efficacy of the system as a positive psychology intervention. EARTH of Wellbeing system can be a useful resource to practice positive emotions regularly, contributing to enhance the wellbeing and facilitating personal growth.

Keywords: Positive Psychology Interventions, Positive Technology, Virtual Reality, Self-help, Information and Communication Technologies, Mood Induction Procedures.

INTRODUCTION

A positive psychology intervention (PPI) has been defined as a "*treatment method, strategy or intentional activity that aim to cultivate positive feelings, behavior, or cognition"* (Sin & Lyubomirsky, 2009 pp. 468). Currently, there is well-founded evidence that shows the effectiveness of PPIs to enhance the subjective and psychological well-being and to reduce depressive symptoms (Bolier et al., 2013, Lin & Lyubomirsky, 2009, Seligman, Steen, Park & Peterson, 2005). Some of these PPIs are specifically addressed to enhance the intensity and frequency of positive emotions. For example, Positive Mood Induction Procedures (MIPs) (Baños et al., 2012; Mammarella, Fairfield & Cornoldi et al. 2007), the Best Possible Self Intervention (Mevissen, Peters & Alberts, 2011), and positive reminiscence (Serrano, Latorre, & Gatz, 2007) can be mentioned among others.

Literature suggests that PPIs can be used in conjunction with preventive interventions and traditional treatments with the aim of strengthening personal psychological resources. In addition, the majority of PPIs are delivered in a self-help format, as evidenced in the meta-analysis conducted by Bolier et al. (2013), where this format obtained small but significant effects. From a cost-effective perspective, self-help interventions can be effective and appropriate tools in the mental health field, although it is necessary to enhance their efficacy (Bolier et al., 2013).

The Information and Communication Technologies (ICTs) are becoming a key tool to enhance psychological interventions (Cavanagh & Shapiro, 2004; Opris et al., 2012, Power & Emmelkamp, 2008;). The connectivity, the speed and the availability of ICTs in our daily routine are redefining our daily life, and also could revolutionize all the field of psychology and other behavioral sciences (Miller, 2012). ICTs are presented as effective and sustainable solutions to public health demands that allow reaching a large number of people with high quality and low cost solutions. All these advantages are being already used in the PPIs. There are available smartphones' Apps and different technological devices aimed to increase positive affect, motivation, etc. (Baños et al., 2012; Herrero et al., 2013, Quero, Molés, Pérez-Ara, Botella & Baños, 2012). Recently, the term of "Positive Technology" (PT) has been proposed to refer to the *"scientific and applied approach that uses the technology for improving the quality of our personal experience with the goal of increasing wellness, and generating strengths and resilience in individuals, organizations, and society"* (Botella, Gaggioli, Wiederhold, Alcaniz, & Baños, 2012 pp. 1). This emerging field combines the objectives of Positive Psychology with the support of ICTs by focusing on three key variables (emotional quality, engagement, and connectedness) that are able to transform our personal experience and build enduring personal resources. Following the PT approach, our team has developed 'EARTH of Wellbeing', a system addressed to generate positive experiences in a controlled way through self-applied PPIs. The aim of this paper is to present a description of the system, to analyze its efficacy to increase positive mood, and to offer data about the users' satisfaction with the application.

METHOD

Participants:

The sample was composed of 38 university students (n= 26 post-graduate student, n= 12 undergraduate students) ranging from 18 to 41 years old (X= 24.58, SD=4.97). All participants were volunteers and signed an informed consent. Participants with high scores on depression (BDI scores >13; Beck, Steer & Brown, 1996;) or anxiety (scores on STAI-S >15 for women and >14 for men; Spielberger, Gorsuch & Lushene, 1970) were excluded.

Measures

State and Trait Anxiety Inventory (STAI, Spielberger et al., 1970). This is a self-administered questionnaire with 40 items divided into two 2 sub-scales which evaluate feelings of anxiety as either traits or states. Only the state subscale was used in this work.

Beck Depression Inventory II (***BDI-II***, Beck et al., 1996). This is one of the most used self-report instruments to assess depression. It includes 21 items to evaluate cognitive, behavioral, affective and somatic symptoms of depression.

Visual Analogue Scale (***VAS*****,** Gross & Levenson, 1995)**:** It is the most widely used instrument for measuring different emotions in mood induction research. In this study a variation of the VAS was used (Baños et al., 2004, 2005, 2008, 2012). Participants were asked to assess the intensity of the four emotions (joy, sadness, anxiety and relaxation) that they were experiencing in a given moment on a Likert scale ranging from 1 ("not at all") to 7 ("completely").

Mood Scale (MS): It is an analogue scale designed for this study. Participants were asked to assess the subjective difference on mood after using EARTH ("In comparison with your mood before using the EARTH system, how are you now, after using it?") in a 1 ("much worse") to 7 ("much better") Likert scale.

Opinion questionnaire: This instrument was designed for this study and includes 3 items regarding the users' opinion about the EARTH system ("If you were not a participant of this study, would you like to use the system?"; "Do you think the activities of the system are

useful?"; "If it was possible, would you like to have the system available at your home?"). Participants had limited space to write their opinions. Once the study was over, three independent blind researchers who did not know the aims of the investigation categorized each answer as positive, negative or neutral.

Program description:

EARTH of Wellbeing is a self-applied and multi-user platform aimed to promote positive emotions and psychological strengths. It includes the 3 following modules.

Park of Wellbeing: It is aimed to induce positive emotions through two virtual environments (VEs), one for joy and the other one for relaxation. Both VEs simulate a park in a city and include different MIPs: music, narratives, self-statements related with positive moods (Velten, 1968), pictures (selected from International Affective Picture System IAPS, Lang, Bradley, & Cuthbert, 1995), movies, and autobiographical recalls. A previous study (Baños et al., 2006) has proved that both VEs were able to induce joy and relaxation in users.

Wellbeing through Nature: It is also aimed to induce joy and relax, and it also includes 2 VEs that simulate a nature landscapes. In each VE the welcome narratives, the off voice, the colors, the melodies and the sounds were chosen to generate the target emotions (joy or relaxation), taking into account previous studies (Gabrielsson & Lindstrom, 2001; Guilford & Smith, 1959). In addition, different psychological techniques are included to facilitate emotional regulation strategies: reminiscence exercises, a brief savoring training and slow breathing. A previous study (Baños et al., 2012) proved that both VEs were able to induce joy and relax in users.

The Book of Life: It consists of a personal diary composed by 16 chapters aimed to recall positive and significant moments of the user's life and past achievements. Each chapter proposes an exercise aimed to train different psychological strengths (optimism, hope, self-esteem, etc.). The user can write and use multimedia resources (images, music, videos) to compose each chapter.

Procedure

Students were recruited from university regular courses. Once the participants signed the informed consent, and filled the questionnaires (STAI-S and BDI-II), they received a username and a password. Post-graduate students were rewarded with academic credits as incentive. Undergraduate students did not obtain any reward. All participants used the system for 6 sessions along 2 weeks. In order to homogenize the use for all participants, they were asked to use the system in a fixed order (see figure 1). Participants came to our lab according to the fixed schedule. They performed the activity alone in a room with the computer. Each session lasted from 20 to 30 minutes. They filled in the VAS scale before and after each session, and the MS and opinion questionnaire at the end of each session.

RESULTS

Descriptive statistics are shown in Tables 1. To evaluate the efficacy of the system to improve positive moods, repeated measured ANOVAs were carried out with the VAS scores (joy, sadness, relaxation, anxiety) with 2 within-subject factors: 'time' (pre versus post session) and 'session' (1,2,3,4,5, & 6). ANOVAs are presented in table 2.

Results showed that joy and relaxation scores increased significantly in all sessions after the use of the EARTH system, while anxiety scores decreased significantly in all sessions (see Tables 1 and 2), obtaining large effects sizes. Regarding the 'session' factor, significant differences were observed only for joy VAS scores. Specifically, the highest levels of joy were found in sessions #2 and #5 ($\bar{x}$ =4.93; $\bar{x}$ =4.77, respectively), followed by sessions 1 and 6 ($\bar{x}$ =4.68; $\bar{x}$ =4.67, respectively) and finally sessions 3 and 4 ($\bar{x}$ =4.48; $\bar{x}$ =4.40, respectively). Finally, regarding "time x sessions" interaction, significant differences in joy and sadness VAS scores were observed and medium and small effects sizes were obtained respectively. Regarding joy VAS scores, sessions where all participants performed Joy VEs (#1) and the Book of Life (#2 and #5) showed significant interactions (see figure 1). Regarding VAS sadness scores, a significant interaction was just found in the session where all participants performed the Joy VEs (#1). For relaxation VAS scores the "time x session" interaction was almost significant, and the sessions

where all participants performed the Book of Life (#2 and #5), Free activities (#3 and #6) and Relaxation VEs (#6) showed significant interactions (See figure 1).

For mood scale, most participants in all 6 session indicated scores above 5 (only 5 answers with scores under 4), meaning that participants improved their mood after using the EARTH system (see Table 1). In order to know whether there were differences in the subjective changes after session along the experiment, an ANOVA with one within-subject factor: ("session") was carried out. No significant differences were observed for 'sessions' in this variable (see Table2).

Regarding preferences, Figure 2 shows the number of participants that chose each module in the sessions of free activity. The most preferred modules were joy and relaxation VEs.

Finally, regarding users' satisfaction with the application, results showed high scores (79%-100% of participants answered that the system was usefulness to promote positive changes, 79%-89% answered that they would use the system if they were not a research participant, and between the 74%-87% indicated that they would want to have available the system at their own home (see tables 3).

DISCUSSION

The aim of this paper was to present a description of the Earth of Wellbeing System and to analyze its efficacy to increase positive mood, and explore users' satisfaction. After each session results showed a significant increase of positive mood and a significant decrease of negative emotions, and no differences along sessions were observed. In addition, participants reported high levels of satisfaction in all sessions.

Results also showed interaction effects indicating that Joy VEs and Book of life induced higher joy than Relax VEs while Relax VEs induced higher relaxation than Joy VEs. These results are in line with previous studies (Baños et al., 2006, 2012) and suggest that the whole system is effective to increase positive mood, and each specific VE (joy or relaxing) is more effective for the target mood it was designed for. This indicates that it is possible to induce specific

emotions, which is an advantage for the design of interventions targeting specific emotion regulation problems.

Overall, results support the efficacy of the EARTH of Wellbeing system as a PPI and add evidence of the clinical utility of self-help PPIs delivered through ICTs. One important finding is that the repeated use of the system did not reduce its utility for inducing positive emotions and users' satisfaction. This good level of acceptance opens the way to explore the utility of this positive technology for addressing other complex aspects such as strengths and general psychological resources, and to promote not only hedonic experiences but also eudemonic ones.

Nevertheless the study presents several limitations. The sample is small and the participants with high scores on anxiety or depression were excluded. It would be useful to assess the efficacy of this system in people with emotional problems. Literature shows that people with emotional disorders suffer disturbances to regulate positive emotions (Carl, Soskin, Kerns & Barlow, 2013), so EARTH of Wellbeing could be a helpful tool for them. Finally, other limitations are the small number of sessions, the absence of control group, and the delivery of the program in our lab at a predetermined schedule.

In spite of these limitations, the efficacy to increase positive mood and the high levels of satisfaction obtained in all sessions can be considered as positive indicators regarding future implementations of this system as a PPI. EARTH of Wellbeing is a self-applied intervention that could be a powerful and useful tool for interventions where "traditional" protocols are combined with self-help online interventions. It is important to delimitate to what extent these new procedures enhance the efficacy and efficiency of evidence-based psychological treatments.

Acknowledgments: This study was funded in part by Ministry of Education, Culture and Sport Spain, Projects EARTH (PSI2010-09568-E) and 'CIBER of Physiopathology of Obesity and Nutrition, an initiative of ISCIII'.

REFERENCES

Baños, R.M., Liaño, V., Botella, C., Alcañiz, M., Guerrero, B., Rey, B., 2006. Changing induced moods via virtual reality. In: Ijsselsteijn, W.A., de Kort, Y., MIdden, C., Eggen, B., van der Hoven, E. (Eds.), Persuasive Technology: Lecture Notes in Computer Science. Springer-Verlag, Berlin/Heilderberg

Baños, R. M., Botella, C., Guillén, V., García-Palacios, A., Jorquera, M., & Quero, S. (2008). Un programa de tratamiento para los trastornos adaptativos: un estudio de caso [A treatment program for adjustment disorders: case study]. *Apuntes de Psicología*, 26(2), 303-316.

Baños, R. M., Botella, B., Alcañiz, M., Liaño, V., Guerrero, B., & Rey, B. (2004). Immersion and Emotion: The impact on the sense of presence. *CyberPsychology and Behaviour*, 7(6), 734-741.

Baños, R. M., Botella, C., Guerrero, B., Liaño, V., Alcañíz, M., & Rey, B. (2005). The third pole of the sense of presence: *Comparing virtual and imagery spaces. PsychNology Journal*, 3(1), 90-100.

Baños, R. M., Etchemendy, E., Castilla, D., García-Palacios, A., Quero, S., & Botella, C. (2012). Positive mood induction procedures for virtual environments designed for elderly people. *Interacting with Computers*, 24(3), 131-138.

Baños, R. M., Liaño, V., Botella, C., Alcañiz, M., Guerrero, B., & Rey, B. (2006). Changing Induced Moods via Virtual Reality. This is a chapter. In W. IJsselsteijn, Y. de Kort, C. Midden, B. Eggen, E. van den Hoven, (Eds.) Persuasive Technology: Lecture Notes in Comnputer Science (pp. 7-15). Berlin/Heilderberg: Springer-Verlag.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). BDI-II. Beck Depression Inventory Second Edition. Manual. San Antonio, TX: The Psychological Corporation.

Bolier, L., Haverman, M., Westerhof, G. J., Riper, H., Smit, F., & Bohlmeijer, E. (2013). Positive psychology interventions: a meta-analysis of randomize controlled studies. *BMC Public Health*, 13, 119.

Botella, C., Riva, G., Gaggioli, A., Wiederhold, B. K., Alcaniz, M., & Baños, R. M. (2012). The Present and Future of Positive Technologies. *Cyberpsychology, Behavior And Social Networking*, 15(2), 78-84. DOI: 10.1089/cyber.2011.0140

Carl, J.R., Soskin, D.P., Kerns, C. & Barlow, D.H. (2013) Positive Emotion Regulation in Emotional Disorders: A Theorical Review, *Clinical Psychology Review* 33(3):343-360.

Cavanagh, K., & Shapiro, D. A. (2004). Computer treatment for common mental health problems. *Journal of Clinical Psychology*, 60(3), 239-251.

Gabrielsson, A., & Lindström, E. (2001). The influence of musical structure on emotional expression. This is a chapter. In Juslin, P., & Sloboda, J. (Eds). Music and Emotion: theory and research (pp. 223-248). New York: Oxford University Press.

Gross, J. J., & Levenson, R. W. (1995). Emotion elicitation using films. *Cognition and Emotion*, 9, 87-108.

Guilford, J. P., & Smith, P. C. (1959). A system of color preferences. *The American Journal of Psychology*, 73(4), 487-502.

Herrero, R., Castilla, D., Vizcaíno, Y., Molinari, G., García-Palacios, A., & Botella, C. (2013). Progress in the Psychological Treatment of Fibromyalgia: the use of virtual reality for the positive emotion induction and to promote behavioral activation. A pilot study. *Revista Argentina de Clínica Psicológica*, 22(2), 111-120.

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1995). International affective picture system (IAPS): Technical manual and affective ratings. NIMH Center for the Study of Emotion and Attention, Gainesville: University of Florida.

Mammarella, N., Fairfield, B., & Cornoldi, C. (2007). Does music enhance cognitive performance in healthy older adults? The Vivaldi effect. *Aging Clinical and Experimental Research*, 19, 394-399.

Mevissen, Y. M., Peters, M. L., & Alberts, H. J. (2011). Become more optimistic by imagining a best posible self. *Journal of Behavior Therapy and Experimental Psychiatry*, 42(3), 371-378.

Miller, G. (2012). The Smartphone Psychology Manifesto. *Perspectives on Psychological Science*, 7, 221-237.

Opris, D., Pintea, S., García-Palacios, A., Botella, C., Szamosközi, S., & David, D. (2012). Virtual reality exposure therapy in anxiety disorders: a quantitative meta-analysis. *Depression and anxiety*, 29(2), 85-93.

Power, M. B., & Emmelkamp, P. M. (2008). Virtual reality exposure therapy for anxiety disorders: A meta-analysis. *Journal of Anxiety Disorders*, 22(3), 561-569.

Quero, S., Molés, M., Pérez-Ara, M. A., Botella, C., & Baños, R. M. (2012). An online emotional regulation system to deliver homework assignments for treating adjustment disorders. *Studies in Health Technology and Informatics*, 181, 273-277.

Seligman, M. E. P., Steen, T. A., Park, N., & Peterson, C. (2005). Positive psychology progress: Empirical validation of interventions. *American Psychologist*, 60, 410-421.

Serrano, J. P., Latorre, J. M., & Gatz, M. (2007). Autobiographical memory in older adults with and without depressive symptoms. *International Journal of Clinical and Health Psychology*, 7, 41-57.

Sheldon, K. M., & Lyubomirsky, S. (2006). How to increase and sustain positive emotion: The effects of expressing gratitude and visualizing best possible selves. The Journal of Positive Psychology, *1*(2), 73–82.

Sin, N. L., & Lyubomirsky, S. (2009). Enhancing well-being and alleviating depressive symptoms with positive psychology interventions. *Journal of Clinical Psychology: in session*, 65(5), 467-487.

Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). Manual of the state-trait anxiety inventory. Palo Alto CA: Consulting Psychologists Press.

Velten, E. (1968). A laboratory task for induction of mood states. *Behavior Research and Therapy*, 6, 473-482.

Figure 1 Activities performed with the EARTH system in each session.

	1st week			2nd week		
# SESSIONS	**1**	**2**	**3**	**4**	**5**	**6**
Activity performed	A joy VEs (Park of Wellbeing or Wellbeing in the Nature)	Book of Life	Free election	A relaxation VEs (Park of Wellbeing or Wellbeing in the Nature)	Book of Life	Free election

Figure 2 Number of participants in each free session

# SESSIONS	**3**	**6**
Joy VEs	15	16
Relaxation VEs	19	14
Book of Life	4	8

1

Table 1 Statistic descriptive for study variables

.	Session 1 ($\bar{x}$ (SD))		Session 2 ($\bar{x}$ (SD))		Session 3 ($\bar{x}$ (SD))		Session 4 ($\bar{x}$ (SD))		Session 5 ($\bar{x}$ (SD))		Session 6 ($\bar{x}$ (SD))	
	Pre	Post	Pre	Pre	Post	Pre	Post	Pre	Post	Post	Pre	Post
VAS												
Joy	4.37(0.78)	5.00(0.93)	4.47(1.13)	5.39(1.08)	4.42(1.11)	4.55(1.06)	4.34(1.15)	4.47(1.20)	4.53(1.13)	5.03(1.20)	4.63(0.91)	4.71(1.14)
Sadness	1.39(0.68)	1.13(0.41)	1.29(0.65)	1.45(1.08)	1.24(0.68)	1.11(0.38)	1.47(0.95)	1.24(0.54)	1.32(0.66)	1.29(0.56)	1.42(0.89)	1.24(0.59)
Relaxation	4.50(1.29)	4.74(1.42)	3.89(1.80)	4.45(1.55)	3.61(1.69)	4.26(1.80)	3.95(1.32)	4.95(1.21)	3.79(1.58)	4.39(1.38)	3.82(1.50)	4.63(1.23)
Anxiety	1.47(0.89)	1.26(0.72)	1.61(0.97)	1.24(0.54)	1.82(1.06)	1.42(0.68)	1.92(1.10)	1.34(0.67)	1.58(0.79)	1.39(0.72)	1.76(1.03)	1.45(0.89)
Mood Scale		5.18(0.61)		5.34(1.02)		4.95(0.83)		5.11(.92)		5.37(0.91)		5.00(0.90)

Table 2 Anovas results

	Time			Session			Time x Session		
	F	**Sig.**	**η2**	**F**	**Sig.**	**η2**	**F**	**Sig.**	**η2**
VAS									
Joy	36.14	**0.00****	0.49	3.08	**0.01****	0.07	6.63	**0.00****	0.15
Sadness	3.69	0.06	0.09	0.88	0.49	0.02	2.47	**0.03***	0.06
Relaxation	24.68	**0.00****	0.40	2.74	0.20	0.07	2.07	0.07	0.05
Anxiety	35.28	**0.00****	0.48	1.59	0.16	0.04	1.42	0.22	0.04
Mood Scale	1.93	0.09	0.05						

p<.05*, <.01**

Table 3 Responses to Opinion questionnaire: percentage analyses.

	Session 1			**Session 2**			**Session 3**			**Session 4**			**Session 5**			**Session 6**		
%	**#1**	**#2**	**#3**	**#1**	**#2**	**#3**	**#1**	**#2**	**#3**	**#1**	**#2**	**#3**	**#1**	**#2**	**#3**	**#1**	**#2**	**#3**
Yes	82	89	74	87	94	81	79	89	74	84	90	79	87	100	84	89	95	87
No	10	3	21	8	3	16	13	3	18	11	5	16	8	0	13	3	0	10
Neutral	8	8	5	5	3	3	8	8	8	5	5	5	5	0	3	8	5	3

(#1 “If you were not a participant of this study, would you like to use the system?”, #2 “Do you think the activities of the system are useful?”, #3 “If it was possible, would you like to have the system available at your home?”)