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Countering obesity by combining behavioural insights and novel ICT tools

A workshop report
4th-5th October 2012
Varese (IT)

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Workshop report

Varese, 4-5 October 2012

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Preface

The Joint Research Centre (JRC) is the European Commission's in-house science service. Within the frame of its Enlargement and Integration Action (E&IA) it also aims to give scientific and technical support to countries on the road towards EU membership, new member states and associated countries[1]. The E&IA funded workshop 'Countering obesity by combining behavioural insights and novel ICT tools' brought together experts with different backgrounds from nutrition and public health to information and communication technologies (ICT), psychology and behavioural sciences. The overarching aim of the workshop was to facilitate scientific and technical exchange on these areas. We capitalised on the participants' expertise to develop ideas for a pilot project to counter obesity by combining behavioural insights and ICT tools. These ideas have been further elaborated into a concrete proposal and are presented in this report.

We are grateful to all participants for their discussions, enthusiasm and valuable contributions that made this workshop successful.

[1] The countries covered by the E&I activities are Albania, Croatia, Former Yugoslav Republic of Macedonia, Israel, Montenegro, Norway, Switzerland, Bosnia and Herzegovina, Faroe Islands, Iceland, Liechtenstein, Moldova, Serbia, Turkey.

Executive summary

The levels of adult and childhood obesity in Europe provide grounds for concern. The problem is persistent and needs particular targeting due to the consequences on public health. In seeking novel approaches to tackle the obesity issue, the Institute for Health and Consumer Protection (IHCP) together with the Institute for Prospective Technological Studies (IPTS) organised the workshop 'Countering obesity by combining behavioural insights and novel ICT tools'. The workshop presented the state of play regarding research and interventions that make use of ICT tools and behavioural insights to target obesity and promote physical activity (PA) worldwide. The data presented by WHO made clear that obesity prevention should be high on government agendas. The discussions that followed are reported in this document and highlight the potential of behaviourally informed measures in this field. The examples presented in the workshop demonstrated that ICT tools such as social network online platforms, smartphone applications, GPS and physical activity trackers and video or exer-games can be used with success as vehicles for delivering such behavioural-informed interventions. Other applications of ICT in addressing the problem of childhood obesity were also discussed. For example, harmonised e-health records can be useful to monitor and collect children's growth data. Of concern, though, is the fact that the ICT and the internet are themselves being increasingly used in marketing practices of high-fat, salt and sugar (HFSS) food products to children.

The workshop was not only used to exchange best practices in this cross-disciplinary field. Taking advantage of the experience and knowledge of all the experts present, we developed a proposal for a pilot experimental project involving social networks and ICT to explore the effectiveness of different reward and incentive schemes to promote physical activity in European children.

Introduction

Obesity levels continue to rise across Europe[2] at a time when it already faces a major financial crisis with rising national debts and budget cuts. Governments are keen to identify areas where policy interventions can become more efficient and effective.

Public health, due to its sheer size in Europe, is one clear area where cost-effective savings and solutions need developing. Addressing the obesity issue has clear short- and long-term public health benefits that will readily translate into concrete savings and economic benefits[3]. The role of ICT in health has been a ripe area for investigation. ICT not only provides people with greater access to information but also changes the ways in which health-service provision is provided. Rapid technological advances are giving rise to novel ways for alleviating the cost of public health.

At the same time, behavioural economics has entered the policy arena in the field of public health. Research in behavioural economics provides a better understanding of how people's health related lifestyle (smoking, eating, drinking or PA habits) can be influenced by subtle changes either in our environment or in incentive-provision schemes[4, 5] . Public health campaigns may have a better chance of achieving their aims if they apply behavioural insights to reach their target population. If well designed, such interventions are generally less costly and more sustainable[6] and the results of behavioural changes can bring substantial health and economic benefits[7].

Based on these premises we asked: **Can ICT and behavioural economics complement each other and be used to promote healthier eating and physical activity?** To help address this question, two Institutes of the Joint Research Centre (the Institute for Health and Consumer Protection and the Institute for Prospective Technological Studies) organised this workshop under the European Commission enlargement and integration programme. The results of the workshop are presented in this report.

The setting of the workshop

The workshop Agenda and a list of the participants with short biographies can be found in Annex I of this report. Further information can also be found in the website associated with the event[8].

The workshop consisted of two types of sessions:

- Plenary sessions presented state of the art data on childhood obesity levels across Europe and different measures to promote healthy behaviours (increasing vegetable and fruit intake, physical activity, etc.). The measures presented were diverse and original and reflected the focus on ICT and behaviour; they ranged from nudging and reward schemes

[2] http://www.euro.who.int/en/what-we-do/health-topics/noncommunicable-diseases/obesity
[3] http://www.oecd.org/health/healthpoliciesanddata/46004918.pdf
[4] Thaler RH, Sunstein C. *Nudge: improving decisions about health, wealth, and happiness.* Yale University Press, 2008.
[5] TM Marteau, D Ogilvie, M Roland, M Suhrcke, MP Kelly Judging nudging: can nudging improve population health? *BMJ 2011*
[6] A. Mani, I. Rahwan, A. Pentland, Localizing externalities in social networks: Inducing peer pressure to enforce socially efficient outcomes, in:Proceedings of the Workshop on Information in Networks (WIN), New York, 2010.
[7] N. Aharonya, W. Pana, C. Ipa, I. Khayala, A. Pentlanda. Social fMRI: Investigating and shaping social mechanisms in the real world. Pervasive and Mobile Computing, 2011, 7(6): 643–659
[8] http://ihcp.jrc.ec.europa.eu/our_activities/public-health/nutrition/workshop-countering-obesity-by-combining-behavioural-insights-and-novel-ict-tools

to the use and combination of games, social networks, social media, smart phones and sports gadgets.

- Brainstorming sessions where the participants discussed the plenary sessions and exchanged ideas and insights. In addition, they were given the task – using their initial expertise and the knowledge gained in the plenary sessions – of devising a pilot experimental project to explore the effectiveness of different reward and incentive schemes in promoting healthy diets and PA in European children.

Plenary Sessions: Where do we stand on ICT and behavioural tools to promote healthy eating and physical activity?

To set the stage and highlight the importance of promoting healthy eating and PA in the context of obesity prevention, **João Breda** (WHO Europe) presented the current figures of obesity in the WHO European Region. The presentation provided an overview of the levels of pre-obesity and obesity in the region and in particular in the EU27 countries (in total and by age groups). Over 50% of the adult population was overweight in 2008 and the WHO's trend analysis indicates that the problem will remain over the next 20 years. A brief description of the European Childhood Obesity Surveillance System (COSI) established by WHO/EURO in fifteen countries was also given. The system aims routinely to measure trends in overweight and obesity in primary school children (6-9 years), in order to understand the progress of the epidemic in this population group and to allow for comparisons between countries within the European Region. So far, information based on this surveillance system is as worrying as that related to adult overweight and obesity. For example, in many countries the prevalence of overweight and obesity among male children and adolescents (5-19 years) was well above 30% (2007 COSI data). The low proportion of children that are exclusively breastfed in the first 3 or 6 months is a cause for concern as too are the high levels of physical inactivity and salt or saturated fat intake that are in clear contrast with and the low levels of fruit and vegetable consumption. The presentation also highlighted a draft report on "vulnerable consumers", published by the European Parliament, with the aim of deploring the marketing of products high in fat, salt and sugar (HFSS) to children and young people. Finally, João Breda also presented the policy framework of the European Charter on Counteracting Obesity, an inspiring document and framework for action on nutrition, PA and obesity in Europe.

Next, **Rene van Bavel** from the JRC, presented behavioural tools that can be used for changing behaviour in several settings and that could be adopted by policy makers. Special attention was paid in the behaviour related to obesity. The assumption that individuals are always rational beings and make decisions in a rational way is inaccurate. In addition, people are particularly resistant to change. "Nudging" can help changing

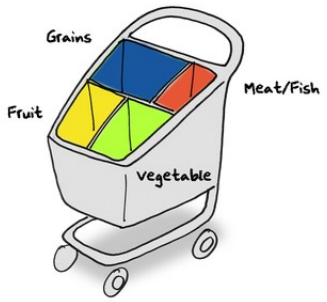

Figure 1: Divided shopping trolleys (Courtesy of IDEO[9])

behaviour and Rene van Bavel focused on this approach. He briefly defined "nudge" as a gentle push that facilitates people's choices towards a particular behaviour[4] and presented several examples on policies or commercial campaigns using behavioural incentives.
One such example is the use of shopping trolleys with specific compartments, properly sized for the shopping of fruits and vegetables (see figure 1[9]) that prompted individuals to buy more fruits and vegetables in New Mexico. Rene van Bavel stressed that *"Nudging aims to change behaviour without changing minds*" and also presented Kahneman's two ways of thinking[10]: system 1 and system 2. The first, more frequent, is automatic, uncontrolled, fast and unconscious while the second is a reflective controlled one. Decisions about nutrition are rooted in system 1 due to their emotional control, a fact which has been massively exploited by food marketers during the last decades. Nudging can be quite inexpensive and while it is likely not the solution to the obesity problem, it should be seen as one of the measures to be seriously considered by policy makers. It is about time that "*the same strategies that have led people to consume too many calories are used to revert the situation".*

Anouk Middelweerd (EMGO, The Netherlands) presented Active2Gether, a project that aims to promote PA among young adults. Physical inactivity is a well established risk factor for premature death but many people in Western countries do not comply with PA recommendations of at least 150 minutes of moderate-intensity activity per week. Active2Gether will take advantage of 3rd generation tailored interventions that can measure PA in an objective way, provide real-time feedback and include social support. In the case of Active2Gether, this will be most likely done via the use of a smart phone application that measures the PA and shares it on Facebook or other social network online platforms (60% of 15-29 year olds have a smartphone in the Netherlands where the study is being carried out).

The extensive work carried out and presented by **Thomas Baranowski** (Baylor University, USA) targets a younger population (children) and uses a different but equally engaging and ICT-based approach of electronic games. Thomas Baranowski presented a preliminary process model of behaviour change from video games that includes elements of Self Determination Theory, Elaboration Likelihood Model, Social Cognitive Theory and Transportation Theory (Immersion) and then showed how these can in fact be built into fun and engaging games like 'Squire's Quest' or 'Escape from Diab' and 'Nanoswarm'. These games promoted healthy behaviours as fruit and vegetable (F&V) intake, and while they mostly succeeded in increasing F&V intake, Thomas Baranowski critically discussed the fact that the changes in children's Body Mass Index (BMI) were not apparent. Other approaches that the group is exploring are active video games or exergames (e.g. Wii or Kinect) and also smartphone apps targeting parents. Thomas Baranowski ended with a 4-page list of future research needs, which highlights that we are just learning how to capitalise on video and exergames, but also their great potential in promoting healthy behaviours in children.

To give an idea of the types of ICT based technology that can be used, **Raija Laukkanen** from Polar Electro Ltd. described some of the products (heart rate monitors and training computers)

[9] http://www.openideo.com/open/how-might-we-give-children-the-knowledge-to-eat-better/concepting/shopping-cart-provokes-healthier-purchases

that the company now produces for running, cycling and multi-sport training as well as activity sensors for physical activity detection. Including target group specific algorithms, these products not only collect data and provide feedback but can also transfer the data to web platforms where they can be analysed and shared with other users such as teachers or friends (e.g. Polar-Active activity monitors and the platform polargofit.com).

Ankur Mani from the Massachusetts Institute of Technology, United States presented the theoretical background and the findings of a research study[6] that used a radically different solution to the problem of global cooperation in large societies via social mechanisms. He focused on how to utilise the power of peers to change behaviour, in particular to promote active lifestyles. An interesting behavioural economics experimental application on PA was also presented[7]. In this experimental setting, three different schemes to reward PA were compared: the first consisted of a financial reward given directly to the person engaged in PA (Pigouvian mechanism); in the second scheme (Pigouvian with peer-information), the person engaged in PA was financially rewarded but in addition, his/her peers were informed about the levels of PA this individual reached; and finally in the third scheme (social mechanism), the individual's peers (but NOT the individual himself/herself) were financially rewarded for the PA. Interestingly, the social mechanism was much more effective - per dollar spent, the social mechanism had twice the effect than that of the Pigouvian mechanism. In addition, this was also the experimental group where the higher PA level was sustained for longer. Commenting on the results, Ankur Mani explained that the effect of the rewards is amplified using the social capital in the network and that these peer rewards cause individuals to cooperate with their peers locally responding to the peer pressure and thus achieving global cooperation.

After discussing experiments and data, it was time for **Troels Andersen** to give a concrete example of an ongoing project, Bike the Track – Track the Bike (B track B), that brings together the behavioural and ICT components that the workshop focused on and aims to increase cycling rates in the cities where it is being rolled out. B track B is based on three components: 1) monitoring PA (in this case biking), 2) publicising the cyclists, and 3) rewarding the cyclists. Monitoring of the biking is performed via RFID tags on the bikes and checkpoint receivers throughout the cities or with GPS technology and smart phone apps. Publicising happens online, for example by sharing the user statistics and comparing scores. Rewarding is based on lottery draws and the prizes are varied having a more symbolic rather than a materialistic sense. The results are also published online and Troels Andersen indicated that the recognition of the winners play a major role in incentivising the population.

[10] Kahneman D. *Thinking, fast and slow* Farrar, Straus and Giroux, 2011

Brainstorming sessions: exchanging ideas and devising a pilot experiment to explore the effectiveness of different schemes in promoting PA and healthy diets in European children.

The participants were divided in two groups (A and B) and the sessions started with broad and loose discussions on ICT and behavioural tools and how they may be used to promote healthier habits. Participants were then asked to focus on proposing a pilot experiment taking advantage of the tools and ideas presented and testing different means to motivate children to move more. In the following 2 pages, we present Tables 1 and 2 that summarise the initial proposals and the points that were taken in consideration by the participants. The JRC has further developed these discussions and thoughts and designed a pilot experiment, described in Annex 2.

Table 1: Brainstorming on a pilot experiment to explore the effectiveness of different schemes in promoting physical activity in European children: summary of the points discussed and decided by Group A			
		Decision by the group	***Reasoning, additional comments and discussion points***
Population group		9-11 yrs	*Peer pressure is usually most effective in adolescents 13+ yrs, but at this age hormonal changes occur so this could complicate things in an intervention. In addition, the instillation of healthy behaviours is better done at an earlier age, 5-9 yrs. However children at that age might bee too young to successfully use ICT.*
Setting		The intervention will take place in schools.	*Optimal design would be 3 schools in the same geographical area. Each school will host a different intervention group*
Targeted behaviour		PA and Diet	
Design	**Sample size**	Approx 200 children per group	
	Intervention groups	3 intervention (int.) groups: · Control group (no int.) · Single reward group · Group/peer reward int.	*Children can be mixed in groups of friends or non-friends for the peer reward.* *Group goals are important because even single members can contribute.*
	Intervention tools	Basic Diet and PA information Reward Schemes	
	Time period	Minimal duration should be 3 months	*Ideally could be extended to a whole school term or even calendar year. Attention should be given to the weather conditions if we are to promote outdoor activities*
	Device	(see comments to endpoints)	*Different applications will be effective in different age groups, like children or teenagers. For example, electronic games would be more applicable to children while social networks would be more attractive to teenagers. Adolescents are a sensitive group; they feel like immortals, having no fear of disease*
	Rewards and incentives	Reward PA: should have a cap, so not to induce exaggerated efforts etc Reward Dietary information: The aim here is not to reward the diet but only to reward the fact that the child provides data on what s/he ate. Data collection should therefore be fun and steer the children into doing it continuously.	*Rewards should be scaled to present more of a challenge after each completion and keep the incentive to play. Rewards can include zoo visits for groups of children, excursions in general (something involving a bit of PA would be nice), party for groups of children & parents, incentives from local communities, various gadgets and or sport equipment. Can also consider ICT or virtual rewards, e.g. website to register PA activity in forms of km walked or biked or steps taken etc to a given target (like a nearby city, the moon, around the globe, capitals of Europe with pictures and info). Rewards can also be extra levels of information on diet & PA unlocked, extra pictures, cooking recipes unlocked etc, mini-games, group healthy meals offered to children and parents etc. The rewards should be periodical to keep up the interest - However rewards should not promote sedentary behaviour in front of the screen, so mini games and point collection to achieve extra levels/content etc is fine while full games that require attention and time are not.*
	Focus groups	Focus groups consisting of teachers, parents advising on what children will like or helping to gather information on the relationships between peers (e.g. surveys, interviews)	
Specified outcome		Endpoint1–PA: Measurement of PA (time dedicated & improvement, not actual performance)	*Tracking gadget/ICT tool feeding into a hosting website. Gadget can be pedometer, accelerometer, Polar-like watch etc. PA activities can be normalized.*
		Endpoint2-Diet: Measurement of basic & representative foods intake via a social website	*A complete report (would be unrealistic for children). It has to be fun, simple and attractive, for example pop ups when they enter the website – ICT incentives may be needed for steady input every day.*
		BMI measurement: BMI could be measured but should not be a primary endpoint	*WHO and IOTF systems could be used.*

Table 2: Brainstorming on a pilot experiment to explore the effectiveness of different schemes in promoting physical activity in European children: summary of the points discussed and decided by Group B

		Decision by the group	***Reasoning, additional comments and discussion points***
Population group		Target group (s) need to be pre-defined.	*Suggestions are to limit the age definition to "junior high school children" and "high school children" to avoid further complications on age definition.*
Setting		The intervention will take place in schools.	*Inclusion of a family intervention component into the intervention is necessary due to influences on lifestyle and health behaviours at such age-groups.*
Targeted behaviour		PA and Diet	
Design	**Sample size**	Not Defined (ND)	
	Type of intervention	ND - *While school is an ideal environment for observing peer-related behaviour of children (age<10), internet based social networks could be a better platform for adolescents whose friendship range has been extended far beyond school doors.*	*The development of the intervention will be based on established theories like Theory of Planned Behaviour/Self-determination Theory, which will support the long term effectiveness of the project.* *The identification of leaders and other key players in the social networks should be vital in a peer based intervention. Social networks analysis would be a good starting point for such a project.*
	Intervention tools	-Use of pre-existing validated tools to assess energy balance-related behaviours -Use of Facebook or video games as an ICT component -Create an independent software application and link it to an existing online social network programme.	*The use of sociometric measures will enable better comprehension of the situation and to build a more effective intervention (identify networks of networks etc.).* *Assessment tools are also needed to understand and evaluate the impact of the intervention.* *Using an internet-based social network entails no control of the data so we need one independent software where we can record data of our population. Ideas or advices on how to develop this kind of application can be given by Random Hacks of Kindness, a global community of innovators building practical open technology.*
	Time period	ND	
	Device	ND	
	Rewards and incentives	Reward could be individual and/or group-centred depending on the main aim of the study.	*Individual rewards could lead to discrimination. Focusing the effect instead at group level will enhance the group spirits i.e., eliminate the negative effect for those not performing. We need to consider that peer-pressure is centred on individual and that also reward might be more practical at individual level. Smart/funny incentives (cartoons etc.) should be more efficient for motivating children in individual level.*
	Focus groups	Implement focus groups to support the main study methodology and design.	*Focus groups, involving representatives of parents, teachers and students are necessary in order to define further steps in terms of study design and intervention details, including type of reward.*
Specified outcome		The intervention outcome will depend on available funding *i.e.*, could assess behavioural change based on questionnaires or BMI.	*Efforts to establish the long term effectiveness should be foreseen.*

Conclusions

While most of the workshop time was used to explore the ways by which ICT and behavioural tools can be used to promote healthy practices, other important points regarding the use of ICT for health were made. An important issue concerns electronic health records since these would be extremely useful for establishing monitoring systems for children's growth. As it stands, in most EU countries children are regularly monitored but the data is not collected. ICT tools could be very helpful in this area to monitor the health of population. People and doctors might need incentives to report to surveillance mechanisms and the costs should also be considered. Another point relates to the issue of marketing (especially to children) of HFSS (high–in-fat, sugar, salt) foods and how internet advertising can escape the marketing regulations imposed on these products. Companies in the private sector are exploiting new technologies in their marketing strategies[11] but policy makers are lagging behind.

A keyword throughout the workshop was prevention. The participants highlighted that interventions to large groups with less health problems have larger effects than interventions in small groups with severe problems. In Europe, initiatives in reducing obesity have been modestly successful with short-term effects. Cost-benefit analysis in non-communicable diseases aim for optimal cost-benefit returns and in nutrition and physical activity (PA), reduction of fat and salt as well as education efforts promoting the merits of PA and diets are considered "best buys". Bringing peers, social support and peer-pressure studies to the scene is important. It was noted however, that negative peer pressure can damage social connections. Peer pressure can be an effective tool and is inexpensive but further research is necessary. The need to understand how to reach people effectively using technologies such as smart phones was also stressed as these are the tools being used by the younger generations. In addition, understanding how to motivate young people to pursue sustainable healthy habits is another important aspect that deserves great attention. The pilot experimental project that was developed at the workshop is a small step in this direction. We hope it may stimulate further ideas and insights into bringing more light to this promising field of research.

As noted above, this workshop was set to answer the question: Can ICT and behavioural economics complement each other and be used to promote healthier eating and physical activity? We would argue that the unequivocal response to this is YES and that indeed the combination of ICT and behaviour-informed measures is a promising mix that should be explored. We focused attention on its potential use in addressing obesity but the approach can easily be deployed to address many other public health and environmental issues that require sustainable behavioural changes from the population.

[11] see for example http://mcworld.com/ or read about other examples in the following NY Times article http://www.nytimes.com/2011/04/21/business/21marketing.html?_r=2&

European Commission

ANNEX I

Countering Obesity by combining Behavioural insights and novel ICT tools

a workshop organised by the Institute for Health and Consumer Protection and the Institute for Prospective Technological Studies in the framework of the Joint Research Centre Enlargement and Integration Action.

Program of the workshop
Workshop participants
Evaluation

Joint Research Centre

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The European Commission's in-house science service

OUR MISSION

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.
Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new methods, tools and standards, and sharing its know-how with the Member States, the scientific community and international partners.
Key policy areas include: environment and climate change; energy and transport; agriculture and food security; health and consumer protection; information society and digital agenda; safety and security, including nuclear; all supported through a cross-cutting and multidisciplinary approach.

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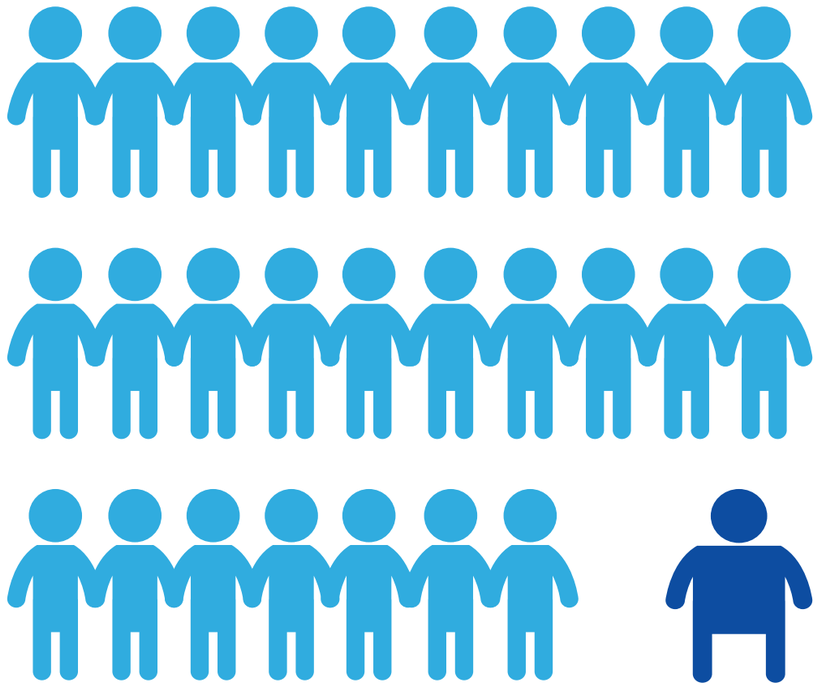


04-05 October 2012

Countering Obesity

by combining **Behavioural Insights** and **novel ICT tools**

Workshop organized by the **Institute for Health and Consumer Protection** (JRC-Ispra), and the **Institute for Prospective Technological Studies** (JRC-Seville) in the framework of the Joint Research Centre *Enlargement and Integration Action*

Joint Research Centre

Background

Obesity levels continue to rise across Europe at a time where we face a major financial crisis with crippling national debts and budget cuts. Governments are keen to identify areas where policy interventions can become more efficient and effective. Public health, due to its sheer size in Europe, is one clear area where savings and bang-for-the-buck will need to be sought. Addressing (and ideally solving!) the Obesity issue has clear short and long term public health benefits that will readily translate into concrete savings and economic benefits.

The role of Information and Communication Technologies (ICT) in health has been a ripe area for investigation. Novel technologies empower citizens by giving them greater access to information and change the way in which they relate to the health system. With technological progress continuing fast, a number of opportunities exist for making the most of ICT to alleviate the cost of public health to the State.

At the same time, behavioural economics has entered the policy arena in the field of public health. Research in behavioural economics provides a better understanding of how people's health related lifestyle (smoking, eating, drinking or physical activity habits) can be influenced by subtle changes in context and incentives. Public health campaigns will have a better chance of achieving their aims if they can build on behavioural insights to target their audience better. If well designed, such interventions are generally cheap but the behavioural changes that could be achieved can bring very large health and economic benefits.

Based on these premises we ask:
Can ICT and behavioural economics complement each other and be used to promote healthier eating and physical habits?
This is the challenge that this workshop seeks to address.

Objectives

- Taking stock of existing initiatives on fighting the spread of obesity in EU27 and Enlargement and Integration (E&I) countries
- Generate a discussion on the merits of nudging for tackling obesity
- Analysis of success factors with emphasis on behavioural aspects
- Developing proposals for improving existing measures or implementing new measures that make use of insights from behavioural economics and ICT

Location: **Palace Grand Hotel Varese**
Via L. Manara, 11 - 21100 Varese (Italy)
http://palacevarese.com/

Programme

Thursday, **04 October**

09.00 – 09.15:	**Nicholas Nicholson** (IHCP, JRC) *Opening of the workshop*
09.15 – 09.25:	**Benedikt Herrmann** (IHCP, JRC) *Goals of the workshop*
09.25 – 09.45:	Tour de table - self-introduction of participants
09.45 – 10.00:	*Coffee break*
10.00 – 10.15:	**João Breda** (WHO - Europe) *Childhood obesity in Europe*
10.15 – 10.45:	**Rene van Bavel** (IPTS, JRC) *Discussion on the merits of nudging for tackling obesity*
10.45 – 11.30:	**Anouk Middelweerd** (VU University, Amsterdam) *Opportunities of social media and mobile phones to empower young people to be physically active: Active2Gether*
11.30 – 12.15:	**Tom Baranowski** (Baylor College of Medicine) *Promoting Healthy Behaviours through Gaming and Social Networks*
12.15 – 13.30:	*Lunch break*
13.30 – 14.30:	**Raija Laukkanen** (Polar) *Polar Solutions: How technology can help*
14.30 – 15.15:	**Mani Ankur** (MIT) *The power of the peers*
15.15 – 15.45:	*Coffee break*
15.45 – 17.30:	**Brainstorming I:** Designing interventions using ICT and behavioural insights to address obesity - developing proposals
17.30 – 18.00:	Summary of first day
19:45:	*Social Dinner to Villa Panza*

Friday, **05 October**

09.30 – 10.00:	**Troels Andersen** (B-Track-B partner) *Promoting family cycling*
10.00 – 10.15:	*Coffee break*
10.15 – 12.00	**Brainstorming II:** Designing interventions using ICT and behavioural insights to address obesity - aiming for (a) concrete proposal(s)
12.00 – 13.00:	Conclusions
13.00 :	'On the go' lunch - End of the workshop

Speakers

Troels Andersen • "B-Track-B" European project

Troels Andersen is a civil engineer specialized in traffic planning with 20 years of references in mainly cycle projects. He is now employed as a traffic planner at the City of Fredericia on behalf of 22 member organizations. He is the chairman for the Cycling Embassy of Denmark and has been the forerunner of many new developed initiatives concerning sustainably mobility such as public transport, car sharing, car pooling and especially cycle promotion. One of his many initiatives is the BikeScore concept which is also the basis of this new European project "Bike the Track – Track the Bike".

Mani Ankur • Massachusetts Institute of Technology

Mani Ankur is a PhD candidate at the MIT Media Lab and a member of the Human Dynamics Group directed by Prof. Alex (Sandy) Pentland. He studies economic and social exchanges in social networks and the mechanism design for networked societies. His research is applied to public policy making and revenue management and it is funded by the MIT Media Lab fellowship, the Martin Family Fellowship for sustainability and Yahoo Key Scientific Challenges program. He received his undergraduate degree in Electrical Engineering from the Indian Institute of Technology, New Delhi and MS degree in Electrical Engineering with a concentration in Arts, Media and Engineering from Arizona State University, USA.

Tomas Baranowski • Baylor College of Medicine

Tomas Baranowski is Professor of Pediatrics in the Baylor College of Medicine in Houston, Texas (USA). His research is directed toward understanding why children eat the foods and engage in the physical activities they do as well as designing and evaluating programs to help change these dietary and physical activity behaviours. He is immediate Past President of the International Society of Behavioural Nutrition and Physical Activity and acts as an editor for several journals including Associate Editor of the Games for Health Journal.

Joao Breda • WHO Europe

Joao Breda is the Programme Manager of Nutrition, Physical Activity and Obesity, Noncommunicable diseases and Health Promotion Division at WHO Regional Office for Europe. He is responsible for providing support to the 53 Member States of the WHO European Region on the implementation of the European Charter on Counteracting Obesity and evaluating its progress. His team is responsible for the largest and most comprehensive childhood obesity surveillance mechanisms globally. He graduated in Nutritional Sciences at Porto University, has an MSc in Public Health as well as an MBA, a PhD in Nutritional Sciences (Porto University). He has worked in the Ministry of Health of Portugal as well as held Professor positions in various Portuguese Universities.

Raija Laukkanen • Polar Electro Ltd

Raija Laukkanen got her PhD at University of Kuopio in 1993. She has acted as a docent (adjunct professor) in health-related fitness at University of Oulu, Department of Health sciences since 1999. She is a fellow of American College of Sport Medicine and a member of European College of Sport Science. She is also a member of exercise and sport science evaluation board of the Ministry of Education in Finland, a founding member and a Scientific Advisor for International Nordic Walking Association and a Board member of Finnish recreational Ski-track Association. Dr. Laukkanen works currently as a Director, Sport Science Collaboration at Polar Electro Ltd, Finland.

Anouk Middelweerd • VU Medical Centre Amsterdam
Anouk Middelweerd is a PhD-student at the VU Medical Centre Amsterdam. She works on a joined project with the department of artificial intelligence on smart coaching strategies that integrate social networks and modern technology in order to empower young people to be physically active. Her master degree is in Health Sciences with specialty Prevention and Public Health and her bachelor degree in physiotherapy. For her master thesis she measured physical activity in daily life in healthy children and compared their results with a group of children with cerebral palsy.

René Van Bavel • EC, DG Joint Research Centre (JRC)
René van Bavel is currently responsible for co-ordinating work on behavioural studies at the Joint Research Centre's Institute for Prospective Technological Studies (JRC-IPTS). Over the past nine years he has worked as a researcher, policy analyst and team leader in the policy areas of information and communication technology and research and innovation. Prior to joining JRC-IPTS in 2003 he taught social psychology at the University of Cambridge. He completed his undergraduate degree in economics at Queen's University, Canada, and his MSc and PhD in social psychology at the London School of Economics.

Participants

Isabelle Aeberli • ETH Zurich
Isabelle Aeberli (PhD) was trained as a food scientist at ETH Zurich, Switzerland. She did a PhD at the Human Nutrition Laboratory at ETH, focusing on dietary determinants of obesity and the metabolic syndrome in children in Switzerland. Embedded in this thesis, she started to investigate the development of childhood obesity in Switzerland, an undertaking which she is still following up today with ongoing studies. She is currently a lecturer and senior scientist at ETH Zurich.

Ines Banjari • University of Zagreb
Ines Banjari (BSc) has graduated from the Faculty of Food Technology, where is working as young scientist and a teaching assistant on the Department of Food and Nutrition Research. She is also a PhD student in the Faculty of Food Technology and Biotechnology, where she will be defending her PhD thesis "Dietary intake and iron status and incidence of anaemia in pregnancy". She is the co-author of several international and national papers and she has recently received training in individualized nutrition in the Basque Country University, Spain, and in diet therapy, in the Clinical Medical Centre of Zagreb, Croatia.

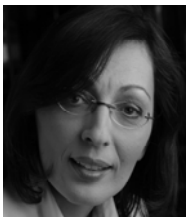
Ragnar Bjarnason • Landspítali University Hospital, Iceland
Ragnar Bjarnason got a medical degree in 1985 from the University of Iceland and doctoral degree from Göteborg University in 1997. His research interest is on growth hormone and treatment of obesity in children and adolescents.

Snezana Barjakarovic Labovic • Bar Health Centre, Montenegro
Snezana Barjaktarovic Labovic, a mother of three children, lives and works at the Health Centre of Bar, a small town on the coast of Montenegro. She is a specialist of Hygiene and is currently enrolled in a Doctoral study in the field of Public Health with a special focus in the field of Nutrition.

Sandra Caldeira • EC, DG Joint Research Centre (JRC)
Sandra Caldeira is a Project Manager in the area of Nutrition and Health at the JRC-IHCP. She holds degrees in Microbiology and Biotechnology and a PhD in Biomedical Sciences. Prior to her current position she worked as a researcher in the areas of cancer, virology and molecular biology, as an invited professor of Genetics at the University of Lisbon and after as a science editor at the European Molecular Biology Organisation (EMBO) where she worked in the areas of Molecular Biology and Molecular Medicine.

Sibylle Christen • Ministry of Public Health, Switzerland
Sibylle Christen (MD) is about to finish the Master's program in communication, management and health (MSc) at the University of Lugano and Virginia Polytechnic Institute and State University (USA). Since May 2012, she is working part-time as a project assistant at the Swiss Conference of the Cantonal Ministers of Public Health and she is a specialist on mental health issues.

Barbara Codan • GeniusChoice
After a scientific high school diploma, Barbara Codan obtained her master's degree in Materials Engineering at the University of Trieste in 2005. Barbara received her Ph.D in 2009 in the same University in the field of Nanotechnology with a thesis on discrete and continuum analysis methods for the mechanical behaviour of the cell. During the Ph.D she spent a period in the U.S.A. at University of California, Irvine. In 2011 she attended the Master's in Complex Actions at SISSA, where she met two of the partners of *GeniusChoice* and the project about *GeniusFood* started.



Irena Colic Baric • University of Zagreb
Irena Colic Baric is a professor at the Faculty of Food Technology & Biotechnology, University of Zagreb. She has established, coordinates and teaches undergraduate and graduate and PhD studies in Nutrition Science, supervising more than ten doctoral and master thesis. She is also a coordinator/participant in national/international scientific and professional projects and author/coauthor of scientific papers and book chapters. She is the president of the Panel on dietetic products, nutrition and allergenic in the Croatian Food Agency and member of the Expert group on food consumption data, EFSA.

Aneta Demerdzieva • University of Skopje
Aneta Demerdzieva (MD, PhD) is a paediatrician working at the Department for infants, metabolic diseases and psychophysiology, at the University of Skopje Pediatric Clinic. She holds an MSc in Pediatrics, and has been working in the field of Biofeedback application in paediatric patients. She also holds a PhD this year on *"Comparative analysis of electrical brain activity between children with anorexia, anxiety and ADHD"*. She has also participated in various of European COST Projects.

Zorica Đorđević • Institute of Public Health, Montenegro
Zorica Đorđević is Medical Doctor and a Hygiene Specialist in the Department of Nutrition and Environmental Health at the Institute of Public Health in Podgorica, Montenegro. Her main activities lie in the area of Food Safety, Nutrition, Environmental health and Medical Ecology

Dominique Durrer • Swiss Medical Association (FMH)
Dominique Durrer (MD) is a General Internist Practitioner FMH specialized in Nutrition, Obesity & eating disorders and Diabetes. She comes from Switzerland (French part). Professional activities: Nutrition, Obesity and eating disorders (Postgraduate Diploma from Paris Univ. Hospital (adolescent Obesity), and Lausanne University (Human Nutrition). Delegate (EUROPREV) to the European Union Platform "Nutrition Physical Activity & Health.

Dana Farcasanu • Centre of Health Policies and Services, Romania
Dana Farcasanu is a public health and health management senior specialist, with more than 20 years of experience, at national and international level, in the field of health systems development, health policy and management, public health interventions. She has worked as technical advisor, evaluator, consultant for many international or bilateral organizations like WHO/EURO, UNFPA, UNICEF, UNAIDS, SDC, USAID, etc. Presently, she is the head of The Centre for Health Policies and Services- Bucharest, Romania.

Raymond Gemen • EC, DG Joint Research Centre (JRC)
Raymond Gemen graduated from the University of Utrecht in Biology and obtained his MSc in Nutrition & Health from Wageningen University. He is currently working as a trainee in the Nutrition team in the Public Health Policy Support Unit, Institute for Health and Consumer Protection, JRC. His ambition is to contribute to human health, for instance by means of communicating of science-based, nutrition-related information. He is particularly interested in the behavioural aspects of nutrition and lifestyle choices.

Jelena Gudelj Rakic • Institute of Public Health, Serbia
Jelena Gudelj Rakic (MD, MSc Nutrition, Specialist in Hygiene) is working at the Centre for Health Promotion, Dept. of Food and Nutrition, Institute of Public Health of Serbia "*Dr Milan Jovanovic Batut" in* Belgrade. She is also the Secretary of the Ministry's of Health National Expert Committee for Prevention and Control of NCD as well as a Member of the National Expert Committee on Child Growth and Development. In addition, she is the WHO national nutrition counterpart and a Member of the Serbian Medical Society, the Serbian Association for the Study of Obesity and the Serbian Nutrition Association.

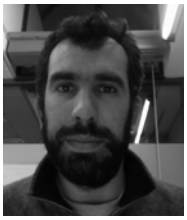
Benedikt Herrmann • EC, DG Joint Research Centre (JRC)
Benedikt Herrmann studied Molecular Biology and Arab language, educated at the universities of Bayreuth, Germany and York, England and trained at the Institute of Bio-organic Chemistry of the Russian Academy of Science in Moscow, Russia. He next did a PhD in applied economics at the University of Goettingen, Germany where he pursued experimental research on cooperation and cooperation enforcement in Eastern and Western Europe, followed by Post docs at Harvard University, USA and the University of Nottingham, England. He joined the European Commission in September 2008 and the JRC in November 2011. He published extensively in economic journals, but also in natural sciences.

Erlingur Sigurður Jóhannsson • University of Iceland

Yannai Kranzler • Ministry of Health, Israel
Yannai Kranzler works for Israel's Ministry of Health as a National Health Promoter and coordinator for the National Program to Promote Active and Healthy Lifestyle. He holds an MA in Public Policy and a BA in Communications. For his doctoral studies, he is researching the health sector's responsiveness toward the policy needs of sectors with which it hopes to partner.

Stefan Leutwyler • Ministry of Public Health, Switzerland
Stefan Leutwyler (MD) is operating as deputy General Secretary of the Swiss Conference of the Cantonal Ministers of Public Health. His main responsibility is to implement the Federal Health Insurance Act and to coordinate with the federal government in the matter of disease prevention and health promotion. As a strategic advisor of 3 national prevention programs, he is involved in the definition of national visions, goals and strategic directions for the future policy on alcohol, tobacco, nutrition and physical activity.

Petros Maragkoudakis • EC, DG Joint Research Centre (JRC)
Petros Maragkoudakis is a Scientific/Technical project officer in the JRC-IHCP focusing on policy support in the field of Nutrition and Public Health. Petros holds a BSc on Microbial Biotechnology and an MSc on Medical Microbiology from the University of Liverpool, as well as a PhD on Food Science/Food Microbiology from the Agricultural University of Athens. He has previously worked as a researcher in various EU, national or industry funded projects publishing peer reviewed articles on probiotics, functional foods and microbial food & feed safety. Additionally he has worked as a lecturer in food science and as a freelance associate for a consultant company in food safety.



Pietro Molini • ICT for Good (ICT4G)
Pietro received his MSc in 2005 in Telecommunications Engineering from the University of Genoa in Italy. He has worked for the University of Genoa, for the Italian National Institute of Nuclear Physics and for the University of Padua before joining the ICT4G at the Fondazione Bruno Kessler in Trento.

Theodora Mouratidou • EC, DG Joint Research Centre (JRC)
Theodora Moratidou has just joined the Nutrition and Health team at the Institute for Health and Consumer Protection, JRC. She holds degrees in Human Nutrition and obtained, in 2007, a PhD from Sheffield University on the Dietary Assessment of pregnant women. Since then she held positions at the WHO and then as a post doctoral researcher in the University of Zaragoza, Spain, working in several obesity related projects such as the FP7-funded HELENA, IDEFICS and ToyBox.

Roberta Nebbia • Licensing Italia
Roberta Nebbia, graduated at Bocconi University in Milan, is the founder and managing director of Licensing Italia, one of the main consultancies in Italy in the licensing industry. Licensing Italia is consultant for Play Entertainment, one of the leading animation's companies in Italy focused on the realization of high-quality artistic and educational contents for children, who is now producing ELFOODZ the first animated series for children, co-produced by RAI Fiction, dedicated to food education and environmental sustainability.

Nicholas Nicholson • EC, DG Joint Research Centre (JRC)
Nicholas Nicholson has been working for the European Commission since 2002 mainly in a programme and projects management related function. Prior to that he worked as a software engineer specialising in data communications for the space and mobile telecommunications industries. He has a degree in Physics and a PhD in Medical Physics and hopes that breakthroughs in behavioural research will soon help him explain his life's choices to date.

Rodica Nicolescu • National Institute of Public Health, Romania
Rodica Nicolescu (MD) has been working in the field of child health since 1995. After medical school she has been trained in the School of Hygiene discipline becoming a Hygiene Expert. She is particularly interested in the physical environment of the child during his school life and also in the laws of mental hygiene, as illustrated by the proper adjustment of the subjects of the curriculum to the mental powers and needs of the children. She is currently the head of the "Children's Health" department in the National Centre for Health Evaluation and Health Promotion. She is the mother of a teenager and thus actively involved in adolescent issues.

Goranka Petrovic • National Institute of Public Health, Croatia
Goranka Petrovic (MD) is as specialist in epidemiology and environmental health, currently working as the Head of the Human Nutrition Department at the Croatian National Institute of Public Health. Her primary area of interest is research of nutritional habits and nutritional status assessment in different population groups, as well as participation in the preparation and implementation of national strategic documents, programs and action plans related to proper nutrition and the prevention and control of chronic noncommunicable diseases. She is also the WHO Nutrition Focal Point for Croatia.

Ljiliana Plavsic • Mother & Child Health Care Institute, Serbia
Ljiliana Plavsic (MD), a mother of three children, is a paediatrician and academic specialist in nutrition. Ljiliana is currently employed at the Mother and Child Health Care Institute of Serbia in Belgrade. Her responsibilities include individual counselling of obese individuals or adolescents with eating disorders as well counselling adolescents with chronic diseases about nutrition and physical-activity habits.

Antonios Proestakis • EC, DG Joint Research Centre (JRC)
Antonios Proestakis has recently joined the JRC-IHCP Public Health Task Force as a Behavioural Economics expert. He is a part of a growing research team providing evidence-based support for the adoption of more effective policies by using experimental and other empirical techniques. He has graduated from the University of Athens and completed his PhD studies in 2011 in the University of Granada, Spain in the field of experimental economics.

Danijela Ristic-Medic • University of Belgrade
Danijela Ristic-Medic (MD, MSc & PhD in nutrition) has specialised in internal medicine and is a dietetic consultant for nutrition and for the clinical management of disease in obese adolescent and adults. She works at the University of Belgrade, Institute for medical research and Centre of Research Excellence in Nutrition and Metabolism. She is actively engaged in basic, clinical and epidemiological nutrition research with publications in international reviewed journals.

Vera Simovska • University of Bitola
Vera Simovska (MD, PhD) is an Ass. Prof. of Food and Nutrition Sciences at the University of Bitola and Visiting Prof. of Health Management at the MIT University. She is working as medical researcher, specialist of sports medicine and subspecialist for hygiene of nutrition for healthy and sick people at the Public Health Institute in Skopje and at the Institute of Sports Medicine, Nutrition Research Unit, for over 30 years. She has experience as an expert at the European Commission: RTD/FP7-KBBE, Food-Health-Well being (2008) and Health (2010) and she has coordinated/participated in several national and EC/WHO projects and programs.

Ziva Stahl • Ministry of health, Israel
Ziva Stahl is the Director of the Nutrition Department, at the Israeli Ministry of health, and a visitor teacher at the Public Health & Epidemiology Department, Ben-Gurion University of the Negev, Israel. She has received her BSc degree from the Hebrew University, Faculty of Agriculture in Rehovot, Israel, her M.Med.Sc & Ph.D degrees are from the Ben Gurion University Of The Negev Isreal, Faculty of Faculty Of Health Sciences. She is also a registered dietitian (RD) in Israel.

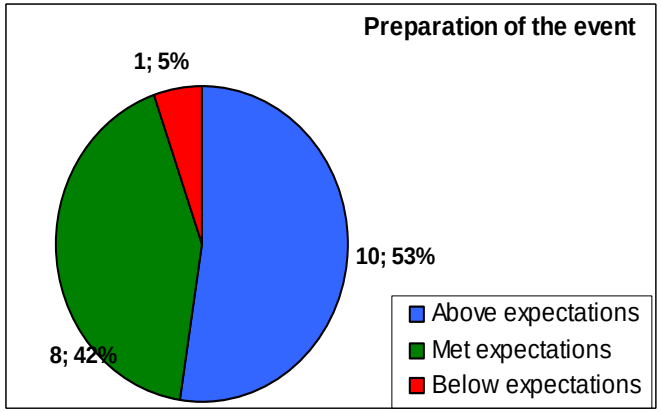
Dragana Stojisavljevic • Public Health Institute, Bosnia & Herzegovina
Dragana Stojisavljevic is medical doctor, specialist of hygiene and health ecology, working in the Department of Nutrition in the Public Health Institute of the Republic of Srpska, Bosnia and Herzegovina. She is a teaching assistant of "Hygiene and Health Ecology" and "Nutrition" on the faculty of Medicine. From 2001, she is nominated as a focal point for nutrition in Ministry of health of Republic of Srpska.

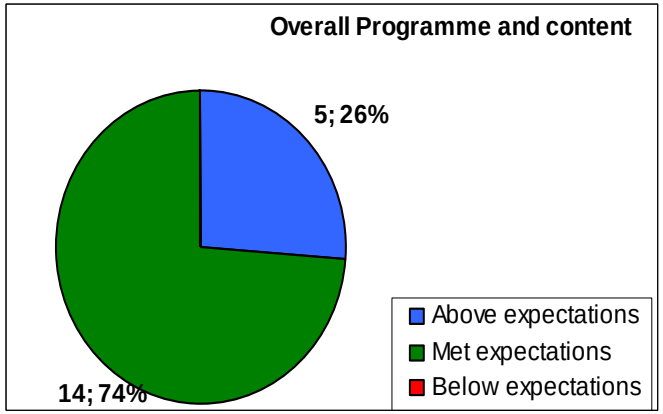
Nadja Vasiljevic • University of Belgrade
Nadja Vasiljevic is a fulltime professor at the Medical Faculty, University of Belgrade. She is a specialist in hygiene, subspecialist in nutrition while she has a PhD in nutrition. She is teaching at undergraduate and postgraduate studies and she is also working as a therapist at Counseling office for diet and nutrition. She is also participating in numerous projects in the diet field as well as in a UNICEF project.

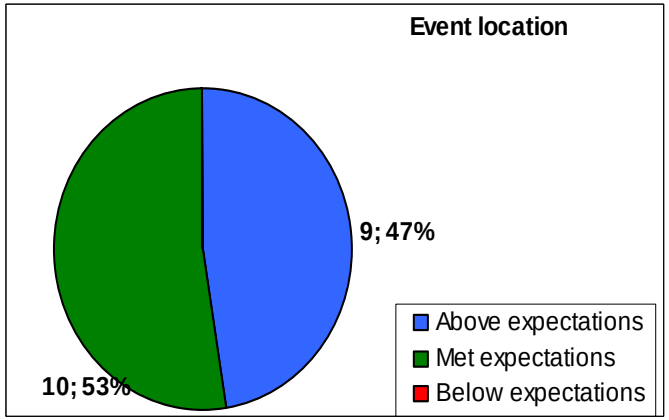
Jan Wollgast • EC, DG Joint Research Centre (JRC)
Jan Wollgast graduated in nutrition and home economics from Justus Liebig University, Giessen, Germany in 1998. He subsequently carried out research on the health effects of polyphenols in chocolate and concluded this project by obtaining is PhD at Giessen University in 2005. Since 2002 he has been working as a scientific officer in the JRC's Institute for Environment and Sustainability (until 2009) and Institute for Health and Consumer Protection, where he is currently working in the area of nutrition and health providing scientific and technical support to EU policy makers in the field.

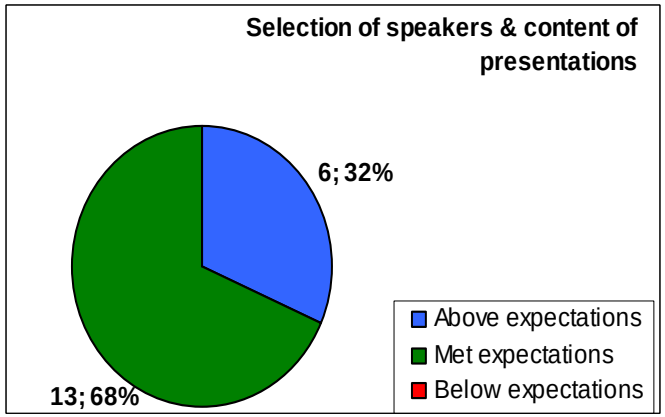
Participant feedback from the JRC Ispra Workshop on *Countering Obesity by combining Behavioural Insights & novel ICT tools*

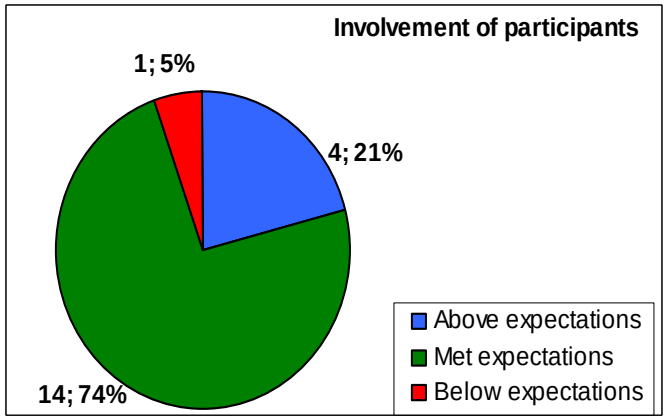
4th – 5th October - Varese, Italy

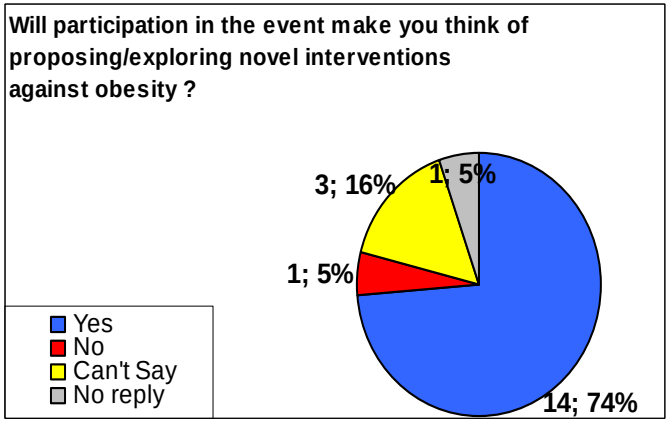












European Commission

ANNEX II

Countering Obesity by combining Behavioural insights and novel ICT tools

a workshop organised by the Institute for Health and Consumer Protection and the Institute for Prospective Technological Studies in the framework of the Joint Research Centre Enlargement and Integration Action.

Increasing children's physical activity: a field experiment

Joint Research Centre

Individual vs. Peer pressure rewards for increasing children's physical activity: a field experiment

Background

The aim of this study is to compare two different peer-incentive schemes (pressure and reward) and individual incentives in promoting children's physical activity (PA) levels, using standardized procedures and protocols. To achieve this, we will first explore and depict the social network characterized by the interactions among children, and then we will test how different intervention approaches, related to peer-pressure, are affecting children PA levels (Aharonya et al. 2011). Children aged between 9 and 11 years have been selected as the target group since their social network is still restricted within "school walls" (DuBois & Hirsch 1990), while they are already receptive to peer pressure (Brown et al. 1986), especially on obesity related issues (Hutchinson & Rapee, 2007). Moreover, engaging in PA at young age appears to prevent future obesity-related health problems (Nemet et al. 2005, Gortmaker et al. 1999).

PA level of each participating child will be measured with a pedometer or any other device suited to measure non-invasive activity levels and connected to a central PA recorder. Children will receive, over a period of three months, either small discrete rewards on a frequent base (twice a week) according to their own PA levels or their peers (other children) levels of PA. The higher the step counts of a child (or his/her friends) the bigger the reward s/he gets.

Intervention Scheme

Measuring baseline PA levels: As the use of any measurement device is likely to have an impact on the participants' PA levels, we will measure the PA levels of the children before any other intervention condition. The participants will simply wear/carry the measurement device for two weeks time. The measurement of the baseline physical activity will also consist of a complete and independent treatment (Baseline Treatment, BT), which will be used for making between-subjects baseline comparisons.

Individual reward treatment (IRT): In the IRT, children are awarded according to their own performance. The more steps the higher their individual reward.

Peer pressure treatment (PPT): In the PPT each child's reward depends on the performance of two other peers (providers), while its own performance affects two other children's (receivers) rewards. In this network structured treatment, providers are always different from receivers. Using this asymmetric scheme, we can evaluate the effect of a single motivation that is to provide a reward to a peer regardless of the rewards received from that peer.

Peer interaction treatment (PIT): The PIT has a closed team structure (of three members) and it forces providers to be receivers at the same time. The performance of each group member has an impact on the rewards of the other two members. Participants in this scheme may feel motivated to do PA to payback a reward received by another child.

Team reward treatment (TRT): All the three members of the closed team accumulate steps together in attempt to win the highest shared prize (equal to the sum of three individual prizes).

While the PPT (compared to ICT) measures the pure peer effect by preventing any mutual based interaction between providers and receivers, the PIT allows for reciprocity additional to peer-effects. Treatment comparison will not only allow us to observe the most effective mechanism but also isolate and independently measure the reciprocity effect. Finally, by performing TRT and compare its average "team" performance with the corresponding one of the PIT the effect of the "team" rather than the individual reward can be evaluated.

Methodology

a. Selection of adequate number of schools with the following characteristics:

- At least five schools in the same region for implementing the five different treatments. Schools should be similar in terms of socio-economic status.
- All schools in the same region (sharing similar climate, environment) but in different buildings/neighbourhoods (to minimise the effect of cross contamination)
- Similar schools with similar sport facilities, offering similar exercising opportunities to students
- Size of class: minimum 24 pupils. Minimum of two classes per school for achieving more than 48 observations per treatment. If participation rates are too low (participation is voluntary), more classes will necessarily be engaged in.

b. Network construction and interaction schemes[1]:

Four "leaders" of the class (ideally two males and two females) will be determined at the start of the experiments (following the advice of teachers and researchers' own observations or simply picked up from students' councils). Leaders will be asked to form groups of 6 members each for participating in a game (which will not at that time be described to them). In random order, each leader will then select his/her first mate. Only, after all leaders have made their first choice, are they asked to choose the second one and so on, up to the selection of their fifth mate. Following this selection mechanism, we ensure that all students are participating and we do not have any "exclusion" problem.

- MT: no further use of the group
- IRT: no further use of the group
- PPT: Participants are informed about their interactive relation with their providers and receivers "randomly" picked from their own 6-members group. For instance, the PA of the group member 1 (GM1) determines 50% of the reward to GM2 and 50% of the reward to GM3. GM1's reward depends on the PA of GM5 (50%) and GM6 (50%). Respectively, GM2 rewards GM3 and GM4 and receives from GM6 and GM1 and so on. Figure 1 depicts the interactions between the members.

[1] We use 24 pupils-classes as a reference point for facilitating description but any other class size can be used.

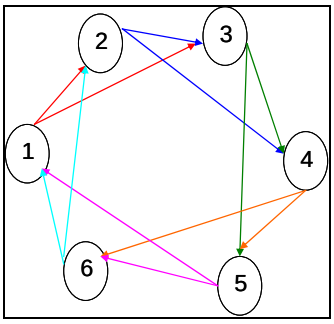


Figure 1: Network interactions in the PPT. Each student rewards the two colleagues on his/her right and receives rewards from the two persons on his/her left.

If the class size is not a multiple of 6, then larger groups should be considered, without having any impact on the rewarding mechanism.

- PIT: Participants are further divided into 2 groups of three members each in a random manner. They are informed about their interactive relation with the other children. In this case the rewarding mechanism is simple (Figure 2); GM1 rewards GM2 and GM3, while at the same time GM1 is rewarded by the same two participants.

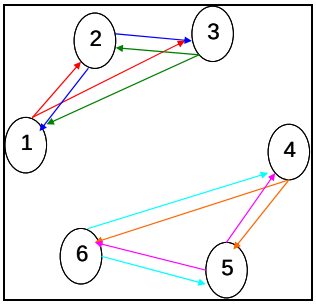


Figure 2: Close-group interactions in the PIT. Each student rewards the same two colleagues who reward him/her.

If the class size is not a multiple of 6, then

i) if there are 1-2 extra students, they will be added to an existing group. Adjustments should be made on the rewarding percentages given to (or received by) other players. (i.e. for 4-members group, each participant sends 33.33% of his rewarding points to each one of the other three participants.)

ii) 3 extra students will form a new 3-members group

- TRT: Participants are further divided into 2 groups of three members each in a random manner. They are informed about their 3-members closed group and their common target. The group is exactly the same size as in the PIT. But there will be only one common reward to all group members. The size of the common reward depends on the cumulative physical activity of all the three members. Finally, the reward is shared among the three members of the group evenly (irrespectively of the individual PA level). In order to perform meaningful comparisons, the common reward should be the triple of the individual reward in PIT.

In addition to the above grouping mechanisms, students will confidentially self-report their degree of friendship with the rest of their schoolmates. This information will not be used as a primary grouping mechanism but the researchers can use it post-experimentally.

c. Total duration: 3 months (minimum) including:

i. Trial period (1 week)

Students are provided with the pedometers and instructions of how to use it. A trial period of one week is given until experimenters are sure that pedometers are used correctly.

ii. Measurement phase – baseline PA activity (3 weeks)

Participants simply wear/carry the measurement device without being exposed to any other intervention condition, for a duration of 3 weeks.

iii. Treatment performance (5 weeks)

Students are assigned to one and only one of the aforementioned treatments and they participate in it for 5 weeks. Additional instructions are given in the beginning of this stage if necessary.

iv. Post treatment performance (3 weeks)

Subjects are requested on a voluntary basis to keep the pedometer for an additional 3 weeks, although no rewards are given for this period. In this way we can check whether the incentives/rewards had a lasting effect on the PA.

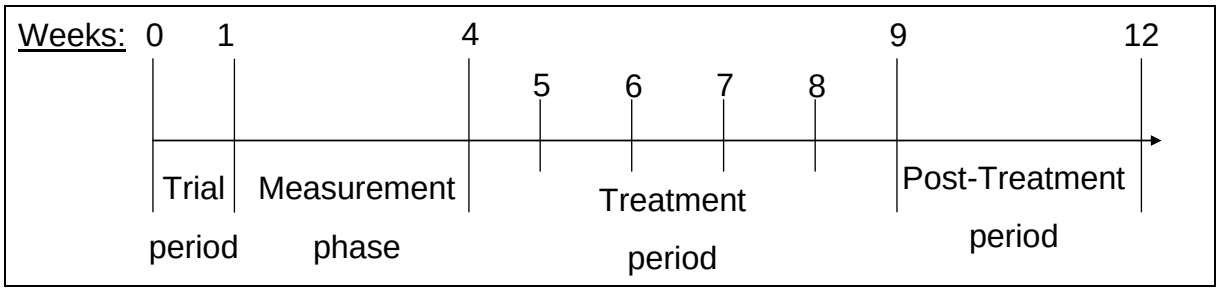


Figure 3: Timeline of the experiment.

The duration of the measurement and post-treatment phase can be flexible, adjusted to the school calendar and needs. However, the 5-weeks treatment period should be very carefully chosen, avoiding any possible interruptions (e.g. holidays or like).

d. Reward mechanism:

Rewards, depending either on individual or on peer performance, are not subject to competition. Each individual can get the maximum prize if s/he herself/himself or her/his mates achieve the highest PA. PA levels measured in the previous week will determine the thresholds for the three rewards (High, Medium and Low) given on the current period. For instance, if in period t-1 the highest 33.33% of the participants have a achieved x_max steps and the lower 33.33% of the participants have achieved a x_min steps, then in period t participants having achieved more than x_max steps will receive the High reward while participants with less than x_min steps will receive the Low reward. Participants with a performance between x_min and x_max will receive the Medium reward. Respectively, the performance of participants in period t will determine the new thresholds for period t+1.

Two different rewards will be given during the week. The school-days reward will be awarded every Friday morning and it will be based on students' performance from Monday to Thursday afternoon. The thresholds

determining Low, Medium and High school-days rewards will be based on the measurements taken from Monday to Thursday of the previous week. Accordingly, the weekend reward will be awarded every Monday morning and it will be based on students' performance from Friday morning to Sunday afternoon. Its thresholds will be determined by the measurement of the previous weekend.
Measurements taken during the last week of the measurement phase (MP) – week 4 – are considered the initial measurements and will determine the thresholds for both school-day and weekend rewards awarded in the first week of the treatment period (week 5).

e. Rewards:

In total, 10 payments will be made. Children will receive vouchers with monetary value which can be exchanged for games or sport equipment (or any other product that children find reinforcing) in a local (or internet) store (probably a sponsor) only after the consent of their parents. The high reward will be equivalent to 5€, the medium to 2.5€ and the low to 0.5€. The maximum potential amount of money is 50€, while the minimum one is 5€. The same is true for TRT as the highest potential common reward will be 15€ (divided evenly to the three participants of the group) and the lowest 1.5€.

f. Sample size:

MINIMUM: 240-300 students. A minimum of two classes (24-30 students per class) for each treatment group. Only one treatment should be conducted per school. Different treatments should be conducted in different schools but during the same period. If there are no any restrictions on the equipment availability then, more classes, following age and grouping prerequisites, can be considered for participating in the research.

g. Conduction period:

The ideal period for the conduction of the experiment is subject to the country specific weather conditions, school calendar and PA infrastructures. Nevertheless, the spring semester could be considered as the most appropriate period since children can more easily participate in outdoor activities (without any extra cost for them or their parents).

h. Information display:

Each student will receive information on his/her own and peers performance, accumulated steps in total and in the last week, rewards, etc. Depending on the school's equipment and students' accessibility to internet, the results will be announced either on a website or by a letter given by the teacher every day.

i. Equipment:

Pedometers or any other suitable equipment measuring PA in a non-invasive way are suggested as the most adequate equipment for measuring PA due to their simplicity and meaningless size, weight, shape. Pedometers' results should also be communicated automatically to a central server, organized and distributed as a feed-back to the students. Equipment's specifications will be further detailed and discussed with the equipment provider (sponsor).
Alternatively, mobile applications using accelerometer-based activity measurements can be considered in the case that all students are mobile users. Focus groups should be performed primarily to the study for answering this and other methodological and designing issues.

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Title: **Countering Obesity by combining a behavioural insights and novel ICT tools: a workshop report**

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Abstract

The levels of adult and childhood obesity in Europe provide grounds for concern. The problem is persistent and needs particular targeting due to the consequences on public health. In seeking novel approaches to tackle the obesity issue, the Institute for Health and Consumer Protection (IHCP) together with the Institute for Prospective Technological Studies (IPTS) organised the workshop 'Countering obesity by combining behavioural insights and novel ICT tools'. The workshop presented the state of play regarding research and interventions that make use of ICT tools and behavioural insights to target obesity and promote physical activity (PA) worldwide. The data presented by WHO made clear that obesity prevention should be high on government agendas. The discussions that followed are reported in this document and highlight the potential of behaviourally informed measures in this field. The examples presented in the workshop demonstrated that ICT tools such as social network online platforms, smartphone applications, GPS and physical activity trackers and video or exer-games can be used with success as vehicles for delivering such behavioural-informed interventions. Other applications of ICT in addressing the problem of childhood obesity were also discussed. For example, harmonised e-health records can be useful to monitor and collect children's growth data. Of concern, though, is the fact that the ICT and the internet are themselves being increasingly used in marketing practices of high-fat, salt and sugar (HFSS) food products to children.

The workshop was not only used to exchange best practices in this cross-disciplinary field. Taking advantage of the experience and knowledge of all the experts present, we developed a proposal for a pilot experimental project involving social networks and ICT to explore the effectiveness of different reward and incentive schemes to promote physical activity in European children.

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