Research Proposal

A - Administrative form (annex 6)
1 - Proposal number: RBSI14SYBL
2 - Proposal acronym (20 characters): ProsocialExpoVirtual
3 – Proposal title: The Effect of Social Exposure and Virtual Reality in Prosocial Behaviour
4 - Duration of the project: 24 month

A.1 – PI and summary of the research
1 - Principal Investigator: Faralla Valeria, Innocenti Alessandro
2 - Date of PhD: 09/04/2010
3 - Publication list (pdf) – only publications in peer-reviewed journals, conferences, symposia and workshops
Mengarelli, F., Moretti, L., Faralla, V., Vindras, P., and Sirigu, A. Economic decisions for others: An exception to loss aversion low. Accepted for publication in PLoS One.
Bimonte, S., and Faralla, V. Happiness and Outdoor Vacations Appreciative versus Consumptive Tourists. Accepted for publication in Journal of Travel Research.
Faralla, V., Innocenti, A., Taddei, S., and Venturini, E. (2013). *Physiological responses to stressful work situations in low-immersive virtual environments*. LabSi Working Papers n. 47, University of Siena, Italy.
Faralla, V., Innocenti, A., and Venturini, E. (2013). *Risk taking and social exposure*. LabSi Working Papers n. 46, University of Siena, Italy.
Venturini, E., Innocenti, A., and Faralla, V. (2013, March 7-9). *The ALBO project- virtual working environments for the detection of organizational well-being*. Paper presented the ALBO Project at the 3rd Global Conference on Experiential Learning in Virtual Worlds, Lisbon, Portugal.
Bimonte, S., and Faralla, V. (2012). Tourist types and happiness: A comparative study in Maremma, Italy. *Annals of Tourism Research*, 39(4), 1929-1950.
Faralla, V., Benuzzi, F., Nichelli, P., and Dimitri, D. (2011). Gains and losses in intertemporal preferences: A behavioural study. In A. Innocenti and A. Sirigu (Eds.), *Neuroscience and the Economics of Decision Making*. London: Routledge.
Faralla, V., Benuzzi, F., Nichelli, P., and Dimitri, D. (2010). *Gains and losses: A common neural network for economic behaviour*. Labsi Working Papers n. 33, University of Siena, Italy.
Faralla, V., Benuzzi, F., Nichelli, P., and Dimitri, D. (2010). *Gains and losses in intertemporal preferences: A behavioural study*. Labsi Working Papers n. 29, University of Siena, Italy.
5 - Publication produced without the participation of tutor specified in the previous paragraph: Faralla, V., Innocenti, A., and Venturini, E. (2013). *Risk taking and social exposure*. LabSi Working Papers n. 46, University of Siena, Italy. ISSN 1825-8131 (ONLINE VERSION) 1825-8123 (PRINT VERSION).
8- Primary ERC sector: SH1 Individuals, Institutions and Markets: Economics, finance and management.
10 - Primary ERC sub-sector: SH1_3 Microeconomics, Behavioural Economics.
12 – Keywords (up to 5): social exposure, choice under risk, prosocial behaviour, experimental economics, virtual reality
13 – Summary (2000-4000 characters): This research project intends to explore the decision-making processes involved in a cooperation task where moral issues are involved, also by using virtual reality tools. In particular, it aims at testing empirically the hypothesis that contribution in prosocial behaviour may be sustained as a result of being observed and promotes the contamination of experimental paradigms (i.e., laboratory experiments and virtual reality techniques) in an interdisciplinary view. The project also intends to identify the role of rationality in prosocial behaviour and the connected role of subjective components and inter-

individual differences (i.e., age, culture, personality) but also of dispositional and situational factors (i.e., lack of self-control, memory limitations, well-being).
The effect of others in individual behaviour seems to be particularly interesting because real life contexts are typically characterized by non-isolation and preferences tend to be affected by social influences, especially under risk or uncertainty. The investigation of individual processes should be conducted in settings as closely as possible to real life situations. To this end, this project involves the use of virtual reality tools. These techniques have been proved to be a useful and valid tool to simulate events and tasks by allowing an accurate control of the setting experienced by the decision-maker. Virtual scenarios can also facilitate the objectivity in judgment allowing the subject to evaluate the scenario while weakening the effect of heuristics and biases.
Subjects in this study will be asked to choose between funding or not funding a charitable institution in a risky decision-making task in which the percentage of the risky option will be randomly determined and varied across the trials. Participants will be informed that they will be observed during the task and the image of a pair of watching eyes will be used. A control group will face the same options of the experimental one without being observed by others. As for virtual reality techniques, a between-subjects procedure will be followed. Specifically, half of participants will be shown a video featuring real actors presenting their charitable institution, whereas the other half will be shown the same video with virtual avatars.
Results obtained in this study can be useful in the understanding of decision-making processes in context of social exposure and prosocial behaviour and in filling the gap in the current literature on this subject. Moreover, results can be used as basic data for experiments to be conducted by means of neuroscientific techniques (e.g., functional magnetic resonance imaging).

A.2 – Information on the HS

Host Institution: University of Siena, Dipartimento di Scienze Sociali, Politiche e Cognitive, Palazzo S. Niccolò, via Roma 56, 53100 Siena (Italy), tel. +39 0577234752, fax: +39 0577234739.

1 - Brief analysis of the adequacy of the host institution to the goals of the proposal (up to 3000 characters): The Host Institution is represented by a community of scholars interested in working together, in an interdisciplinary way, on common research projects This is quite an innovative step in the cultural academic tradition of Italy. In the past, only a few Italian departments have hosted such a plurality of scientific and methodological approaches that cut across traditional scholarly disciplines. The Department is active at both national and international level, with several faculty members running national, European and international research projects as well as projects at local and regional level and with private foundations. It enjoys a good research ranking in our University and such a diverse number of scientific disciplines, methodological approaches and research interests makes ours a vibrant and lively academic community.

B – Research proposal

B.1 – Detailed description of the project

1 - Objective and expected results (3000-10000 characters): The study of individual decision-making in social setting is an interdisciplinary area of research, from psychology and economics, to cognitive science and social neuroscience. The main aim of this research project is to clarify the effect of social exposure in prosocial behaviour. The project intends to explore the decision-making processes involved in a cooperation task where moral issues are involved, also by using virtual reality tools. This research aims indeed at testing empirically the hypothesis that more cooperation in prosocial behaviour may be sustained as a result of being observed during the process of choice. In particular, this research project:

- shall investigate how decision-makers being observed by other individuals when making choices are influenced in their decision to contribute in a prosocial task, how

forms of contribution can be facilitated and conditions for successful cooperation can be identified.

- shall articulate and develop theories/models based on results obtained, to improve the understanding of decision-making processes in context of social exposure and to fill the gap in the current literature on this subject.
- shall promote the contamination of experimental paradigms (i.e., laboratory experiments and virtual reality techniques) replying to the need of experimental sciences to investigate individual behaviour in a more naturalistic environment where both cognitive and emotional dimensions could be investigated in its elementary aspects keeping the requisite of external validity. The virtual simulation is suitable for this kind of analysis, because it can produce real situations while having the control of environment where subjects interact.
- shall confirm and testify the effectiveness of virtual reality tools in an interdisciplinary context of research. Virtual simulations allow to consider the complexity of decisional processes and to monitor at the same time emotional reactions and cognitive system, in analytic and experiential modality, of the subjects involved handling typical problems connected with laboratory experiments (e.g., the problem of information overload by making users' attention focused on a subset of factors, the temporal latency of the consequences of present choices, the saliency of external factors otherwise neglected, the lack of awareness, and the assessment of the effect of cognitive biases). Moreover, by inducing less emotional involvement, low-immersive virtual environments are supposed to activate different cognitive mechanisms of perception. This expected result will be tested through the use of physiological measures (i.e., heart rate and electromyography) during the exposure of subjects to real and virtual videos.

At the same time, however, there are some additional points that should be further investigate in the current research project giving continuity with previous research conducted by the principal investigator. This project also:

- shall identify if any changes in the level of cooperation in prosocial behaviour as effect of social exposure and/or virtual reality occurred in connection with changes in rationality of the individual's decision-making process.
- considering that social preference has significant inter-individual differences—and indeed some people care more than others about other individual's welfare, the current research project is also interested in considering subjective components to include in the data analysis such as age, culture, personality, and other inter-individual differences but also dispositional and situational factors (i.e., lack of self-control, memory limitations, well-being) which could affect individual risky behaviour but have been not yet extensively investigated in the context of social exposure. This could be realized by means of personality tests and questionnaires.

2 - State of the art (1000-3000 characters): The effect of others in individual behaviour seems to be particularly interesting because everyday people make their own decisions observing/being observed by others in their natural environment. Nevertheless, classical theories describe decision-making as an individual process, disregarding the fact that real life contexts are typically characterized by non-isolation (i.e., *social exposure*; see Yechiam et al., 2008) and preferences are affected by social influences, especially under risk or uncertainty. As a result, little is still known about decision-making in contexts in which people make their own decisions with the possibility to observe others' behaviour or, inversely, being watched. The same impact of social exposure on rationality remains largely unclear. Particularly, it is not clear if rationality and cooperation, especially in prosocial behaviour, would increase or decrease as a consequence of social exposure. Preliminary findings showed that the mere presence of others has been found to play a large role in the perception of risk (Faralla et al., 2013; Hamed, 2001; Sueur et al.,

2013, Zhou et al., 2009) but also subjects cooperation. Bateson et al. (2006) found that the level of individual contribution is higher in the presence of a cue of being watched. Moreover, Haley and Fessler (2005) provided evidence that eye-spots tend to increase the generosity of participants, a finding which was confirmed by later studies on charitable donations (Ekström, 2011; Powell et al., 2012). The investigation of individual processes should however be conducted in more evocative settings in order to mimic closely as possible real life situations in the laboratory. To this end, virtual reality has been proved to be a useful and valid tool to simulate events and tasks by allowing an accurate control of the setting experienced by the decision-maker (Harrison et al., 2011). Virtual scenarios can also facilitate the objectivity in judgment allowing the subject to evaluate the scenario while removing, or at least weakening, the effect of heuristics and biases. The use of avatars instead of physical subjects seems to give a high sense of co-presence without the inhibition of the self's openness toward the interlocutor (Riva, 2005).

3 - Methods (3000-10000 characters): The study should be realized as a behavioural experiment using the programming software z-Tree (Fischbacher, 2007). The experiment will be tested on graduate and undergraduate students (males and females) to be recruited via email announcements among first-year university courses or students who do not have prior knowledge of research and theory on decision-making processes. Each subject will receive an initial endowment and will be required to complete a task involving two separate sessions. In both sessions, participants will be informed that they will observed during the task and the image of a pair of watching eyes will be used in order to sharpen the feeling of social exposure during decision-making. In the first session (social exposure with non-compulsory levy condition), subjects will be asked to choose between funding or not funding a charitable institution. If the participants choose not to fund the charitable organization, the institute will close at the end of the year with a probability of 100%. Otherwise, if the participants decide to fund the organization, the institute will survive with a percentage which will be randomly determined and varied across the trials. Accordingly, for each choice, subjects will be asked to select a safe option, connected with the funding of the institute, or a risky option related with the non-funding alternative. The risky option will be randomly presented, counterbalancing for the left and the right side of the screen. In order to analyze reaction times, no time limits will be given for the experiment. The second session (social exposure with compulsory levy condition) will be identical to the previous one except for the fact that the levy will be compulsory and that the participants will be asked to select a preference between two different charitable organizations (A or B). In particular, the compulsory levy required for the A institute will be higher than that for the B institute. In case of donation to the B institute, however, there will be a percentage of risk that someone in the organization may steal the money donated. A risk not applying for the A institute. As a result, for each choice in this second session, subjects will be asked to select a safe option (fund the institute A) or a risky option originated from the possibility of fraudulent activity after charitable donation to B institute. The order of the sections will be counterbalanced across subjects. A control group (control condition) will face the same options of the experimental one without being observed by other subjects, that is individually (no watching eyes). Participants will be paid in cash for participation at the end of the experiment. As for virtual reality techniques, the between-subjects procedure will be followed. Half of participants, randomly chosen, will be shown a video featuring real actors presenting their charitable institution (baseline condition). The other half will be shown a video with virtual avatars, instead of real actors, representing the same situation (virtual reality condition). The videos will be developed in collaboration with experts in virtual reality techniques. Virtual versions with avatars and real actors will be exactly of the same length and storyline. In each condition, preliminary instructions will be offer a detailed description of the events displayed during the experimental trials so that it will become clear that subjects will make decisions with/without the presence of others and the use of virtual reality techniques.

In order to investigate the additional objectives, rationality, empathy, and other questionnaires and tests will be also provided at the end of the sessions. Specifically, participants will be assessed on Big Five personality traits using a 10-item measure developed by Gosling et al. (2003), which was found to have high correlation with the longer version of the Big Five inventories (John and Srivastava, 1999). As for virtual reality, all participants will be also submitted a self-report questionnaire designed by the team of research for the assessment of cognitive and emotional states of the participants. The questionnaire comprises sixteen items assessing participants' emotional state during the experimental task on a ten point scale from 0 (no emotion) to 10 (highest level of emotion). In addition, physiological responses (i.e., heart rate and electromyography) will be recorded during both the baseline and virtual reality condition.

4 - Potential applications, scientific and/or socio-economic impact, technology advancements, brief remarks on ethical issues or security (1000-3000 characters): The project will provide medium and long term impacts with potential applications in interdisciplinary field. In the medium term, it will fill a gap in the literature about decision-making processes in prosocial behaviour and social exposure. It will also testify the effectiveness of virtual reality tools in an interdisciplinary context of research. The project will produce and disseminate results through seminars and talks at major international conferences but especially through articles to be published in peer-reviewed international journals. In the long term, the project will provide useful input for further research projects to be submitted to international foundations and research councils during the next years. Particularly, results obtained in this study can be used as basic data for experiments to be conducted by means of neuroscientific techniques (e.g., functional magnetic resonance imaging). Insights from the field of neuroscience could indeed provide a powerful contribution to the understanding of mechanisms underlying social influence in decision-making. The present study will be conducted in adult healthy volunteers from which standard informed consent will be required. The proposed research will involve observation of other people's choices but the observation will be limited to the laboratory experimental sessions as described in the "Methods" section. No EUCI is involved in this proposal.