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Can love and forgiveness defeat addiction?

Project Consulting Agreement #3534.00, 2013
Second Pilot study's learning

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Preliminary results and findings
from 1st and 2nd wave of data collection.

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MASI PROJECT

Project Consulting Agreement #3534.00, 2013

Can love and forgiveness defeat addiction?

Second Pilot study's learning

Preliminary results and findings from 1st and 2nd wave of data collection. The way ahead

1. Participant communities

As thoroughly described in the **Technical report** on the 1st Wave, prepared during March 2014 and used as a basis for discussion during the meeting of the Steering Committee held in Milano, CSCC, on April 14th 2014, the pilot study has been implemented in 5 rehab communities, as in Table 1.

Table 1 Rehabilitation communities participating to the MASI Project

Community (Short Name)	Full name	Location
Arezzo (AR)	Casa Jeshua	Central Italy
Caltanissetta (CL)	Casa Famiglia Rosetta	Southern Italy
Frosinone (FR)	Casa Madre - Nuovi Orizzonti	Central Italy
Pistoia (PT)	Casa San Francesco	Central Italy
Trento (TN)	Casa Luce sul Monte	Northern Italy

All the communities have been visited by at least one member of the research team who explained in details the scope and methods of the MASI project. In particular, great attention has been devoted to assure that the ideal conditions for the experiment were met, namely the availability of one or more personal computers connected to the internet in a quiet room, in order to preserve the anonymity of responses.

As explained in details in the Second Pilot Research Plan and Timeline (October 30, 2013), the study consists of two waves: the first includes people just entering the rehab community; the second includes the same people after a rehabilitation period (through community life) of about six months. The time distance

between waves is shorter than the 'optimal', as we wanted to gather some learnings by mid-2014, in order to be able to submit the detailed Research Proposal, including budget, for Research Funds, according to the project that was recommended during the April 24-27, 2012 FAC Meeting .

As regards the first wave, the questionnaires were compiled between November, 27th 2013 and December, 6th 2013; the second wave was administrated between May, 7th and 12th 2014. Hosts of rehab communities who took part in our study are referred to as **agents**. As explained in the March, 28th 2014 Technical Report, some of the sections in the questionnaire included interactive situations that yield non-monetary payoffs (cigarettes).

2. General overview of the collected data

2.1. Participants to the study and parameters of interest

In the first wave of data collection the total number of agents is 35, distributed among communities as described by Table 2. In the second wave the number of agents is 19 (due to dropouts). The Table also includes the indication of the number of agents who are under substitutive therapy, an occurrence only pertaining to the Trento community.

Table2 Agents by community

	Wave 1		Wave 2		Dropout
Community	**Agents**	**In therapy**	**Agents**	**In therapy**	**rate**
Arezzo	7	0	5	0	28.57%
Caltanissetta	10	0	5	0	50.00%
Frosinone	5	0	3	0	40.00%
Pistoia	5	0	2	0	60.00%
Trento	8	3	4	0	50.00%
Total	**35**	**3**	**19**	**0**	**45.71%**

After data collection, a set of variables have been generated, summarizing personal characteristics, behavioral indicators and psychological indicators of each agent. Table 3 provides the outline and description of the variables, along with the indication of its type (C=personal characteristics; B=behavioral indicator; P=psychological indicator).

Table 3 Description of the variables used in MASI study

Type	Variable Name	Variable Description
C	**age**	Age of agent
C	**siblings**	Number of siblings in agent's household
C	**household**	Number of total people in agent's household
C	**religion**	Religious affiliation of agent (1=Christian; 2=Atheistic/Agnostic; 3=Other)
C	**education**	Level of education of agent (1=Primary; 2=Middle School; 3=High School; 4=University)
C	**status**	Self-perceived overall socio-economic condition of agent (1=Wealthy; 2= Affluent; 3=Average; 4=Poor)
C	**days**	Number of days since arriving at the community
P	**esteem**	Self-esteem scale (range 10-40)
B	**dictator**	Share of cigarettes given to Recipient in Dictator Game
B	**idr3_1**	Implicit maximum Inter-temporal Discount Rate 1
B	**incons3_1**	Dummy variable equals to 1 if agent choices are inconsistent in idr3_1
B	**idr3_2**	Implicit maximum Inter-temporal Discount Rate 2
B	**incons3_2**	Dummy variable equals to 1 if agent choices are inconsistent in idr3_2
B	**idr3_3**	Implicit maximum Inter-temporal Discount Rate 3
B	**incons3_3**	Dummy variable equals to 1 if agent choices are inconsistent in idr3_3
B	**ultimatum**	Minimum Acceptable Offer (MAO) in Ultimatum Game
B	**bart**	Number of cigarettes obtained in the BART
B	**trust**	Share of cigarettes given to Respondent in Trust Game
P	**exp_neg**	Experience-based self-forgiveness Scale, negative indicators (range 7-49)
P	**exp_pos**	Experience-based self-forgiveness Scale, positive indicators (range 4-28)
P	**mullet_1**	Lasting Resentment Scale (range 6-66)
P	**mullet_2**	Sensitivity to Circumstances Scale (range 6-66)
P	**mullet_3**	Unconditional Forgiveness Scale (range 5-55)
P	**mullet_4**	Sympathy Scale (range 3-33)
P	**mullet_5**	Mastery Scale (range 3-33)
P	**mullet_6**	Affection Scale (range 3-33)
P	**mullet_7**	Morality Scale (range 3-33)
B	**gratitude**	Average share of cigarettes returned to Proponent in Gratitude Game
B	**grat1_3**	Average share of cigarettes returned to Proponent in Gratitude Game, cases 1-3
B	**grat4_6**	Average share of cigarettes returned to Proponent in Gratitude Game, cases 4-6
B	**grat7_8**	Average share of cigarettes returned to Proponent in Gratitude Game, cases 7-8
B	**grat_diff78**	Difference in shares of cigarettes returned to Proponent between cases 8 and 7.
C	**therapy**	Dummy variable equals to 1 if agent is on substitutive therapy

Finally, in order to provide a more detailed outlook of the sample, Table 4 presents the overall mean values and standard deviations for all the variables (excluding **therapy** and the 3 "diagnostic" variables related to inter-temporal discount rates, i.e. **incons3_1**, **incons3_2** and **incons3_3**).

2.2. Inspection of the sample

Table 3 is organized as follows. The first two columns report the statistics of all the respondents that participated to the first wave (35 observations); the following columns present within-wave statistics and overall statistics referring to the second wave's sample (19 observations). The difference in the sample size is due to dropouts.

Table 4 Summary statistics: mean (mode for categorical variables) and standard deviations, full and matched sample

	FIRST WAVE (35 obs.)		FIRST WAVE (19 obs.)		SECOND WAVE (19 obs.)	
Variable	**mean**	**sd**	**Mean**	**sd**	**mean**	**sd**
age	36.09	10.90	35.95	10.56	36.58	10.66
siblings	0.94	1.16	1.16	1.34	1.05	1.31
household	4.06	1.49	4.26	1.48	3.37	2.01
religion*	1	-	1	-	1	-
education*	2	-	2	-	2	-
status*	3	-	3	-	3	-
days	64.94	67.87	57.84	53.50	203.53	64.53
esteem	27.09	3.79	26.84	3.98	26.84	2.57
dictator	0.43	0.21	0.44	0.24	0.34	0.17
idr3_1	44.55	20.79	46.74	21.61	54.70	21.73
idr3_2	19.95	7.97	21.81	7.78	21.24	7.34
idr3_3	37.11	33.11	36.30	35.20	36.50	34.74
ultimatum	0.27	0.19	0.26	0.17	0.29	0.15
bart	9.31	2.86	9.24	3.12	4.32	1.87
trust	0.41	0.21	0.41	0.19	0.39	0.15
exp_neg	20.49	10.28	19.47	10.61	17.32	10.11
exp_pos	20.06	6.55	18.95	7.87	18.68	7.30
mullet_1	21.91	14.18	21.11	14.30	21.16	14.33
mullet_2	27.60	13.16	26.47	10.50	26.37	13.29
mullet_3	27.91	13.93	28.79	13.55	27.37	15.18
mullet_4	22.31	9.58	20.89	10.10	19.32	8.86
mullet_5	12.11	7.85	11.21	7.76	10.58	5.42
mullet_6	16.34	10.31	17.84	10.04	13.63	9.44
mullet_7	25.03	7.66	23.63	8.60	21.58	10.04
gratitude	0.42	0.16	0.44	0.12	0.46	0.15
grat1_3	0.40	0.21	0.46	0.16	0.45	0.22
grat4_6	0.42	0.17	0.43	0.14	0.45	0.16
grat7_8	0.45	0.15	0.45	0.11	0.49	0.12
grat_diff78	-0.02	0.07	-0.03	0.07	0.01	0.23

* Categorical variable, only modal value is reported

The inspection of first wave's statistics allows to assess the quality of sampling. Jointly looking to mean values and standard errors in Table 4, personal characteristics appear to be rather homogeneous across the sample, especially in the case of **siblings** (whose median value is 1, but left-skewed), **religion**

(over 80% of agents define themselves Christians, and the residual part Atheistic/Agnostic), **household** composition (with a bi-modal distribution, with mean and median around 4), **status** (the distribution is highly concentrated, with 23 out of 35 agents self-defining "average" and 9 "poor") and **education** (over 65% of agents has "middle-school" degree, about 20% "high school"). The most important element of potential heterogeneity is **age**. On average, the agents in the sample are 36 years old, but the standard deviation is quite high and does not substantially decrease after drop out in the second wave. Although age shows a distribution that is approximately mean-centered, the wide range (spanning from 18 to 64 in the first wave and from 18 to 54 in the second wave) and the limited number of observations makes it a potential source of heterogeneity that is analyzed in the next section.

More generally, a potential source of bias in the analysis could be given by a process of self-selection of similar agents within different communities. As shown in Table 2 above, agents are not evenly distributed across communities. Table 5 offers a snapshot outlook of the average and modal values of some personal characteristics variables for each community. As the Table 5 shows, for the Second wave the main differences among communities mean values are due to **age** and **days**.

Table 5 Mean (mode) values of Personal Characteristics in wave 2, by community

community	age	siblings	household	religion (mode)	education (mode)	status (mode)	days	*agents*
Arezzo	38.20	0.40	2.80	1	2	3	187.20	*5*
Caltanissetta	33.20	2.20	4.60	1	2	3	237.00	*5*
Frosinone	40.33	0.67	3.00	1	2	3	226.67	*3*
Pistoia	44.50	0.00	1.00	1	2	4	164.00	*2*
Trento	32.00	1.25	4.00	1	2	3	184.50	*4*
Total	**36.58**	**1.05**	**3.37**	**1.11**	**2.11**	**3.26**	**203.53**	***19***

As reported in Section 4 of the March 28th Technical Report, all variables have been inspected through non parametric tests (Kruskall-Wallis rank-sum test; ANOVA permutation test) in order to exclude the occurrence of self-selection bias across communities.

These tests have been chosen to account for the small group (community) sample size and to deal with non-normality. As expected, both tests provide approximately the same results, confirming that the null hypothesis of equal distributions across communities cannot be rejected (except in three cases), thus excluding that the parameters of interest are systematically different among communities. This is an important finding as it implies that the agents can be thought as randomly assigned to each community. Inspection of the collected data revealed that in general the experimental design does not suffer for possible self-selection bias.

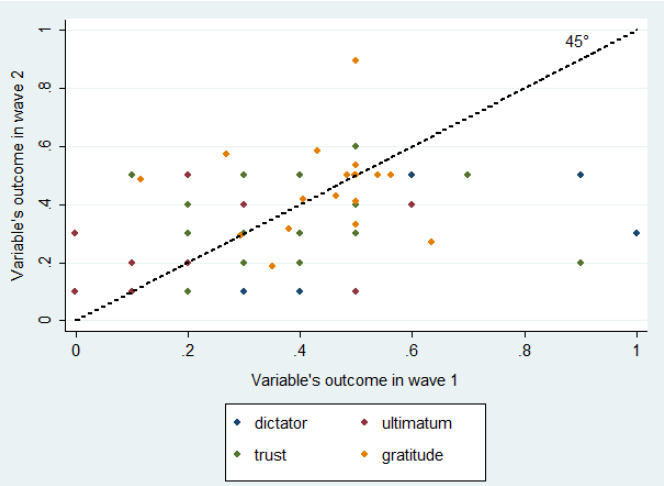
3. Preliminary results

The purpose of this section is to illustrate the analysis of the within-agent variation of the parameters of interest, following the grouping of variables suggested in Table 3.

3.1. Behavioral Indicators

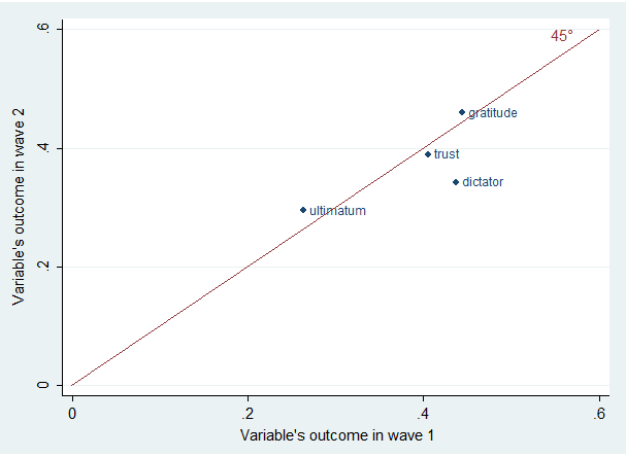
Figure 1 scatters the values of **dictator**, **ultimatum**, **trust** and **gratitude** observed in wave 2 against their observed values in wave 1. The farthest from the 45° line, the largest the variation between the two observations of the parameter of interest for each agent.

Figure 1 Scatter of Behavioral Games' outcomes in wave 1 and 2



At a glance, it is possible to see that most observations for all the four games are not on the 45° line, indicating that a variation actually occurred. Moreover, variations tend to be almost evenly spread above and below the 45° line. This results in small average variation, as in Figure 2. Results for **dictator** exhibit a significant decrease.

Figure 2 Scatter of Behavioral Games' outcomes in wave 1 and 2: Mean variations



To provide further information on the extent of the change, Table 6 illustrates the average variations between the mean values in wave 1 and wave 2. As a robustness check, a truncated mean is also considered, eliminating the positive and negative peaks (i.e. dropping 2 out of 19 observations). Moreover, in the lower panel, the table also includes information on the distribution of the variations, summarizing the percentage of agents recording a positive or negative or null change for each parameter's value.

Table 6 Summary of within-agent variations in parameters values between wave 2 and wave 1

	Behavioral Games			
	dictator	**ultimatum**	**trust**	**gratitude**
parameter's theoretical range	0/1	0/1	0/1	0/1
parameter's observed range	0/1	0/0.6	0.1/0.9	0.12/0.89
mean variation	-0.095	0.032	-0.016	0.015
truncated mean variation (2/19)	-0.082	0.041	0.000	0.015
Distribution of variations				
% positive variations	21.1%	52.6%	42.1%	42.1%
% negative variations	57.9%	21.1%	42.1%	47.4%
% no variations	21.1%	26.3%	15.8%	10.5%

The combined information of Figure 2 and Table 6 can be summarized as follows:

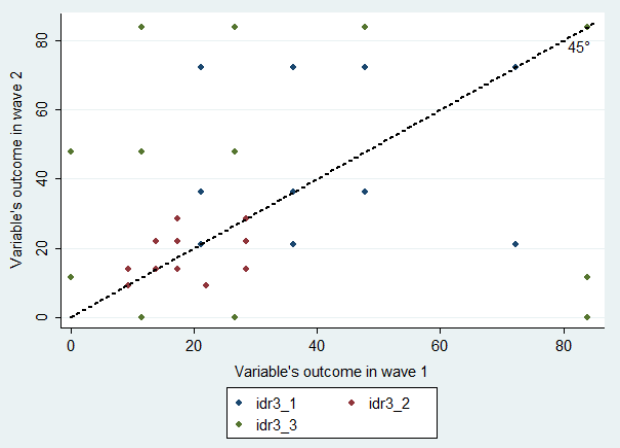
- **dictator** decreases in wave 2, indicating that, on average, the attitude towards altruistic behavior decreased after six months in community. This pattern is confirmed also by the distribution of the variations; the average magnitude is not negligible, being about 0.1 (i.e. corresponding to one cigarette);

- **ultimatum** increases in wave 2, indicating that agents' MAO (Minimum Acceptable Offer) is higher: therefore, inequity aversion has increased, on average. Interestingly, the magnitude of the variation, though small in absolute term (½ cigarette), is equivalent to 5% of the observed range.

- **gratitude** and **trust** both record very small average variations. However, the total percentage of agents who actually changed their choice is higher than in the previous two games; recorded changes are opposite in sign, thus leading to stable averages.

The same analysis has been carried out on the variations of intertemporal discount rates (**idr**). Figure 3 shows that changes are larger for **idr3_1** and **idr3_3**, than for **idr3_2**.

Figure 3 Scatter of Intertemporal Discount Rates' outcomes in wave 1 and 2



Once mean values are considered, the result is summarized in Figure 4. Here the interpretation is straightforward: on average, only **idr3_1** (whose reference point in time was the same day of the interview) increased, implying an increase in impulsivity as measured by a higher discount rate for future consumption; while **idr3_2** (reference points one months ahead) and **idr3_3** (control test) are very close to the 45° line, implying no variation on average.

Figure 4 Scatter of Intertemporal Discount Rates' outcomes in wave 1 and 2: Mean variations

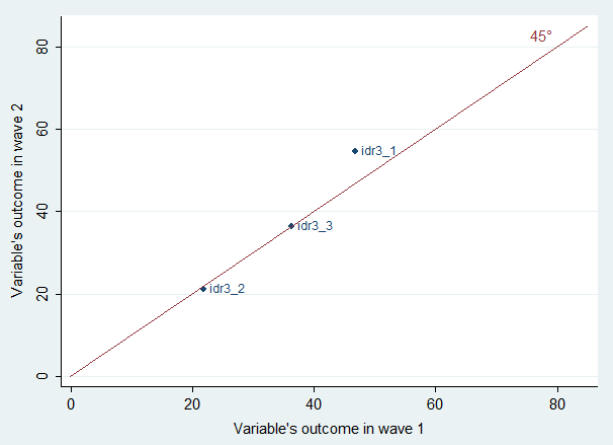


Table 7 helps confirming this result: in fact, the magnitude of average variations is very low as compared to the range of the observed values, with the only exception of **idr3_1**. Moreover, for **idr3_1** and **idr3_2** almost half the sample recorded no variation at all.

Therefore, given the combined information of Figure 2 and Table 7, the results relating to **idr** can be summarized as follow:

- **idr3_1** increases, implying an average increase in impulsivity (when immediate consumption is compared to delayed consumption). All this increase is actually driven by nearly half the sample;
- **idr3_2** shows substantial persistence across the two waves, as almost half of the agents do not change their choices, and the rest of the sample is equally split between increasing or decreasing rates;
- **idr3_3** is a control question, related to **idr3_1**, namely, discounting future amounts rather than deciding the acceptable reward for waiting. Comparing the two outcomes signals some inconsistencies in agents' choices as **idr3_3** exhibits a much lower variation than **idr3_1**. This result could be due to the fact that answering **idr3_3** implies a more sophisticated line of reasoning.

Table 7 Summary of variations in parameters values between wave 2 and wave 1

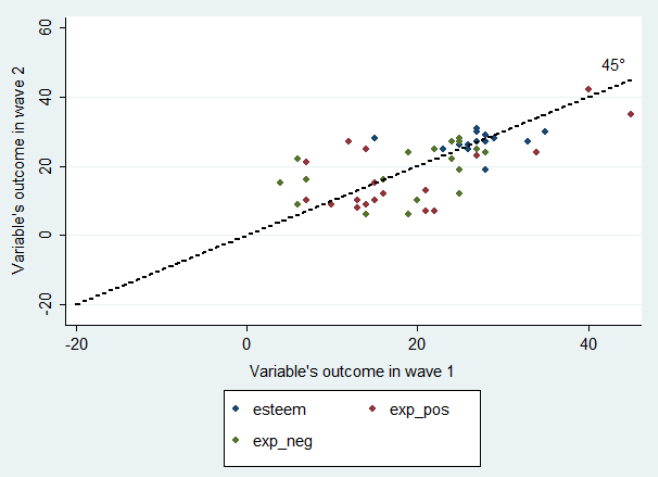
	Intertemporal Discount Rates		
	idr3_1	**idr3_2**	**idr3_3**
parameter's theoretical range	21.14/72.29	9.33/28.43	0/83.92
parameter's observed range	21.14/72.29	9.33/28.43	0/83.92
mean variation	7.963	-0.570	0.190
truncated mean variation (2/19)	8.900	-0.428	0.897

Distribution of variations			
% positive variations	36.8%	26.3%	52.6%
% negative variations	15.8%	26.3%	36.8%
% no variations	47.4%	47.4%	10.5%

3.2. Psychological Indicators

A similar analysis can be conducted on the parameters P, referring to different dimensions of forgiveness. Figure 5 illustrates the comparison between outcomes in wave 1 and 2 of the parameters included in the questionnaire, namely Self-esteem (**esteem**) in Section 1 and Experience-based Self-forgiveness (**exp_pos**; **exp_neg**) in Section 7.

Figure 5 Scatter of Section 1 and 7 parameters' outcome in wave 1 and 2: Mean variations



According to Figure 5 individual values of all three variables actually vary between the waves. Though, once again, individual variations average out. In Figure 6, two out of three parameters (**esteem** and **exp_neg**) are very close to the 45° line, while **exp_pos** presents a slightly larger variation.

Figure 6 Scatter of Psychological Indicators' outcomes in wave 1 and 2: Mean variations (1)

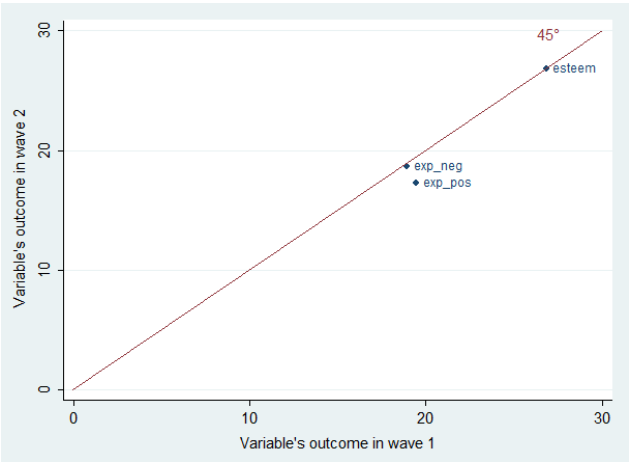


Table 8 Summary of variations in parameters values between wave 2 and wave 1

	Psychological Indicators (1)		
	esteem	**exp_pos**	**exp_neg**
parameter's theoretical range	10/40	7/49	4/28
parameter's observed range	15/35	7/45	4/28
mean variation	0.000	-2.158	-0.263
truncated mean variation (2/19)	-0.235	-2.412	-0.471
Distribution of variations			
% positive variations	36.8%	26.3%	47.4%
% negative variations	47.4%	68.4%	47.4%
% no variations	15.8%	5.3%	5.3%

Table 8 shows that two out of three parameters (**esteem** and **exp_neg**), though presenting a high frequency of variation, exhibit average values very close to 0. In other words, the positive and negative individual variations of these two parameters almost perfectly compensate, leading to an average null variation. The mean value of **exp_pos** present indeed a slightly different picture: in this case, almost 70% of observations record negative variations and consistently the average variation is negative and non-negligible in magnitude (corresponding to about 5% of the observed range).

The same analysis has been provided for the set of Psychological Indicators included in Section 8 of the questionnaire (**mullet_1,** Lasting Resentment**; mullet _2,** Sensitivity to Circumstances; **mullet_3,** Unconditional Forgiveness; **mullet_4,** Sympathy; **mullet _5,** Mastery; **mullet_6,** Affection; **mullet_7**, Morality).

Figure 7 Scatter of Psychological Indicators' outcomes in wave 1 and 2: Mean variations (2)

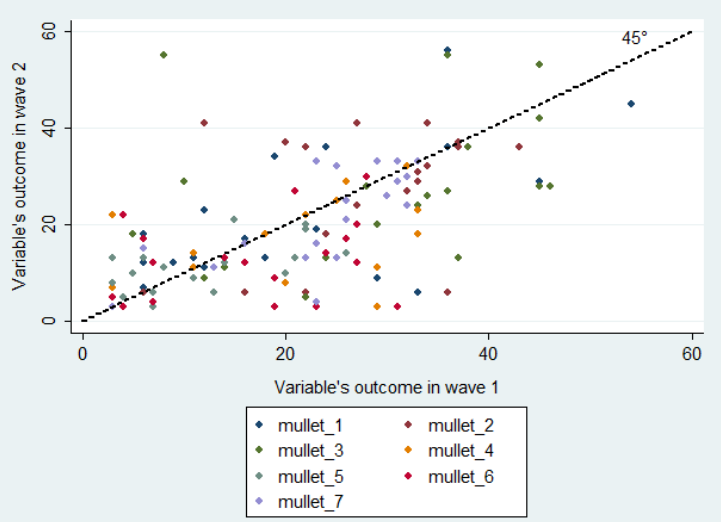


Figure 7 plots all the individual outcome of the 7 parameters of interest, comparing wave 1 and wave 2. Again, the figure shows that individual variations occur with wide dispersion, with many individual variations averaging out.

Figure 8 Scatter of Psychological Indicators' outcomes in wave 1 and 2: Mean variations (2)

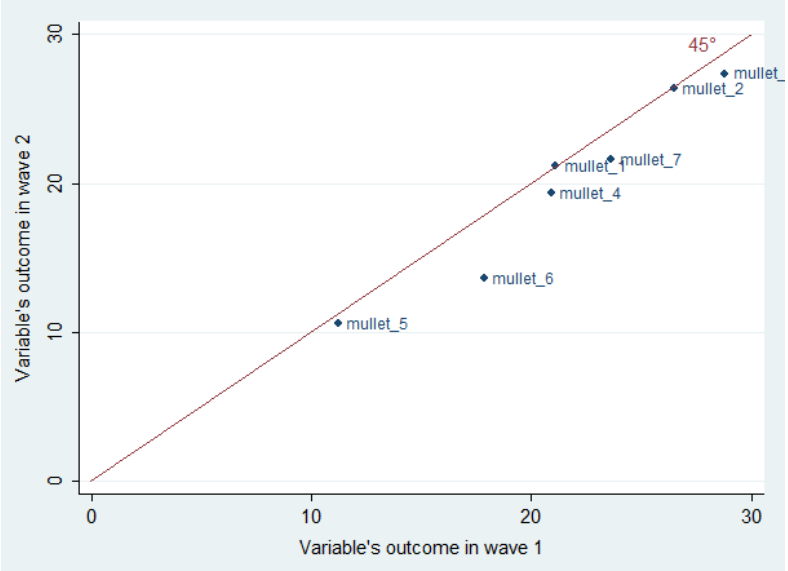


Figure 8 shows average variations, highlighting that almost all the parameters in Section 8 on average decreased, with the notable exception of **mullet_1** (Lasting Resentment) and **mullet_2** (Sensitivity to Circumstances) whose observations fall very close to the 45° line. Again, a clarifying summary is provided in Table 9.

Table 9 Summary of variations in parameters values between wave 2 and wave 1

	Psychological Indicators (2)						
	mullet_1 Lasting Resentment	**mullet_2** Sensitivity to Circumstances	**mullet_3** Unconditional Forgiveness	**mullet_4** Sympathy	**mullet_5** Mastery	**mullet_6** Affection	**mullet_7** Morality
parameter's theoretical range	6/66	6/66	5/55	3/33	3/33	3/33	3/33
parameter's observed range	6/56	6/43	5/55	3/33	3/26	3/33	3/33
mean variation	0.053	-0.105	-1.421	-1.579	-0.632	-4.211	-2.053
truncated mean variation (2/19)	0.471	-0.059	-2.941	-1.353	-0.588	-4.118	-1.765
Distribution of variations							
% positive variations	52.6%	31.6%	26.3%	42.1%	42.1%	31.6%	26.3%
% negative variations	36.8%	57.9%	68.4%	31.6%	52.6%	63.2%	57.9%
% no variations	10.5%	10.5%	5.3%	26.3%	5.3%	5.3%	15.8%

As Table 9, bottom panel, shows, the large majority of agents changed their answers between wave 1 and wave 2. In at least three cases (**mullet_1**, **mullet_3** and **mullet_7**) there is a substantial difference between the mean values and the truncated mean values, implying that outliers exert an important role in affecting the final result.

Finally, the combined information of Table 8 and Figures 7 and 8 allow to conclude that in general the average variation of the parameters in Section 8 (measuring forgiveness and its correlates) draw attention to a "worsening" of the ability to conceptualize forgiveness.

3.3. Textual information

In order to add further qualitative information to the collected data, two further sources of textual information have been added to the Second Pilot study.

The first one consists of agents' motivations briefly explaining their choices after completing a behavioral economic task (i.e. after **dictator**, **ultimatum**, **trust**, **gratitude**). This information is simply typed by agents right after the completion of the task. This information has been codified by our research team according to the standard classifications motives as emerging from a thorough survey of the existing literature on the subject. The preliminary qualitative inspection of this further source of data suggests the presence of two patterns: persistency and internal coherence within subject; a tendency to smooth "extreme" positions when moving from wave 1 and wave 2.

The second source of textual information consists of a set of open-question oral interviews submitted to staff members, directors and former agents in each community.[1] The transcriptions of these extended interviews will be used in a further step of the analysis to perform quantitative textual analysis. We expect this further step to improve the parametric and non-parametric analysis of the data. For the moment, some rough statistics yielded the words cloud in figure 9, size proportional to frequency.

Figure 10 Words cloud, based on interviews with communities' staff members, directors and former agents

Two preliminary considerations can be provided: the variety of non-trivial words used in the interviews suggests that each interviewed individual has unique emotional experience in living the community life, thus offering nuanced and differentiated expressions of the community's identity.

[1] For a total of 15 interviews, one for each different three type of subjects in all 5 communities.

However, the remarkable prevalence of words such as Love ("Amore"), Respect ("Rispetto"), Forgiveness ("Perdono"), Communion ("Comunione") suggests the primary role of these dimensions in community-based rehab process.

Interviewed were also asked to identify 7 key-words to describe their own community; Table 10 records them.

Table 10 Key-words describing each community, as offered by staff members, directors and former agents [2]

Arezzo	ex-addicted	amore, perdono, fraternità, rispetto, dolore, comunione e pazienza.
	social worker	fraternità, amore, uguaglianza, benevolenza, guarigione, passione, sorriso
	director	comunità, coraggio, umiltà, cuore, sogno, caos, unità
Caltanisetta	ex-addicted	onesta, rispetto, perdono, comprensione, lavoro, tenacia, motivazione
	social worker	accogliente, familiare, discreta, comprensiva, professionale, seria, disponibile
	director	relazione, équipe, comunità, amore, cultura, rispetto, innamoramento
Frosinone	ex-addicted	gioiosa, impegnativa, forte, attuale, senza una lira, solidale, caritativa
	social worker	accoglienza, amore, cambiamento, impegno, serietà, verità, umanità
	director	potenzialità, famiglia, persona, comunione, guarigione, Vangelo, speranza
Pistoia	ex-addicted	amore, perdono, condivisione, altruismo, donazione di sé stessi, rispetto, preghiera.
	social worker	gioia, amore, verità, umanità, inferi, guarigione, Gesù
	director	amore, unità, comunione, riservatezza, disponibilità, comprensione e autorevolezza
Trento	ex-addicted	fede, coraggio, amicizia, donazione, allegria, sbattimento, impegno costante
	social worker	amore, accoglienza, casa, cambiamento, libertà, fatica , forza
	director	amore, famiglia, professionalità, trasparenza, attenzione al singolo, crescita professionale, qualità.

3.4. Parametric and non-parametric analysis

Although the qualitative analysis suggests that a change occurred in individual values of behavioral and psychological indicators, non-parametric and parametric tests, based on average values, do not allow to detect statistically significant changes on the parameters of interest (with exception of **idr3_1** and **idr3_2**).[3] Several causes can be at work in determining such results.

The first refers to sample size: changes were not statistical significant due to the small size of the sample, which tends to overweight the effect of outliers; and to the limited amount of variance of measured variables. In order to increase sample size, we decided to perform the same set of tests by comparing averages values obtained in wave 2 with average values obtained in wave 1 before dropout (i.e. considering all 35 agents in wave 1, and 19 in wave 2). This analysis can be justified by the fact that dropouts do not differ from other agents (as far as the measured variables are concerned) in a statistically

[2] English translation provided in Table A1

[3] With the only exception of **idr3_1**, which significantly increased.

significant way[4]. The second refers to the compressed time lapse between wave 1 and wave 2, set approximately to six-months, due to contract arrangements. The third refers to the inappropriateness of average indicators to describe the individual agents' behavior and capture its changes.

Despite all of the above, the data collected through this pilot study provide interesting results that can be summarised in terms of **convergence**, as explained below.

4. Findings and discussion

As shown in Section 3, the qualitative presentation of the results suggests that some process of individual change is actually on-going. Living for a period of a few months in a rehab community changed individual agents' behavioral and psychological traits, even if averages did not significantly vary.

In particular, we observed that in a number of cases averages remained stable because of opposite changes recorded by large and balanced shares of agents. As this outcome may be the consequence of two different dynamics (positive versus negative feedbacks), we decided to test which of the two was in place, through what has become known in the empirical analysis of growth economics as "beta-convergence". Technically, we calculated the correlation coefficients (and we also performed an OLS estimation) between the initial value of a given variable, recorded at wave 1 for each agent, and its variation over time (measured as the difference in the same variable between waves). A negative correlation coefficient (and a negative coefficient of the initial value of the variable in the OLS estimation) indicates the existence of a convergence dynamics, which reveals that agents showing higher than average levels of a given variable in wave 1 reduced that value in wave 2; and *vice versa.*

Table 11 Correlation coefficients between change in parameters' values and corresponding starting levels in wave 1

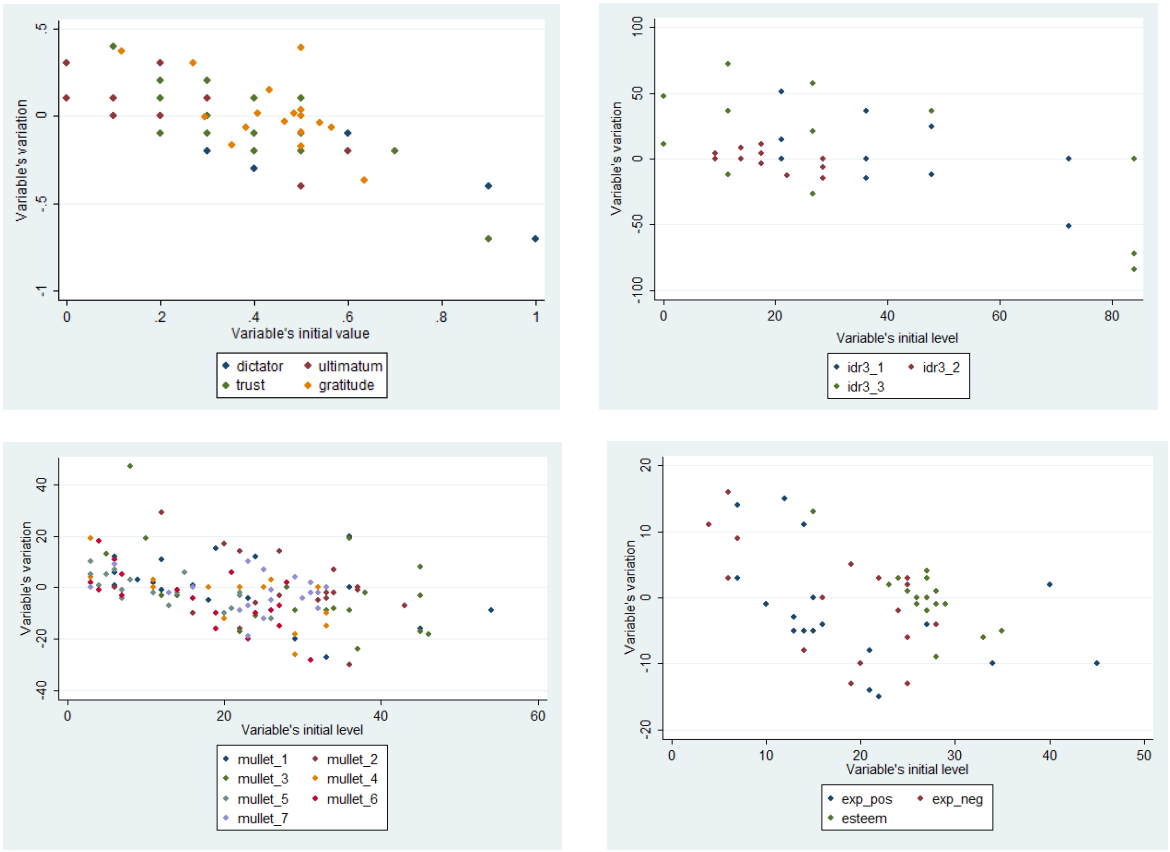
P and B variables	Correlation coefficients
esteem	-0.822***
dictator	-0.734***
idr3_1	-0.558**
idr3_2	-0.472**
idr3_3	-0.719***
ultimatum	-0.656***
trust	-0.768***
exp_pos	-0.455*
exp_neg	-0.565**
mullet1	-0.417*
mullet3	-0.516**
mullet4	-0.645***
mullet5	-0.717***
mullet6	-0.603***
gratitude	-0.574**

Note: *** significant at 1% level; ** significant at 5% level; * significant at 10% level

[4] Data available on request

Convergence can also be graphically shown as negatively sloped clouds of individual markers in a scatterplot, where variations of the variable measures are plotted on the vertical axis and initial levels on the horizontal axis (Figures 12).

Figure 12 Scatterplots between change in variables across waves and initial levels in wave 1



A possible explanation of observed convergence could be the following: community life produces as an immediate outcome the reduction of 'extreme' behaviors and psychological traits. Reducing 'extreme' behavior can be illustrated as follows, with reference to **trust,** as an example. It is very problematic not to trust anyone; it is also problematic, for opposite reasons, to trust everyone. Hence, we deem convergence to be an appreciable initial effect of community live on agents' choices.

Convergence can be shown also by comparing the standard deviation of individual variables across waves. The standard deviations of most behavioral indicators (**dictator**, **ultimatum**, **trust**, **idr3_2**, **idr3_3**) and of most psychological indicators (**esteem**, **exp_pos**, **exp_neg**, **mullet_4**, **mullet_5**, **mullet_6**) are smaller in wave 2 than in wave 1 (as shown in Table 4). In other words, the variability of the outcomes of these parameters has decreased.

A further research question concerns the relative importance of two possible determinants of convergence: is convergence the intended outcome of community's educational project, and/or is it the mere effect of living together in a small community (peer effects)? A first tentative answer would be that, since we observed a convergence process across agents irrespective of the specific community in which

they live, we would suggest that the appropriate interpretation is that community life *per se* tends to reduce 'extreme' behaviors and traits.

To provide further evidence of this claim, we performed the same test we used for 'general' convergence limiting the sample to each community, where agents share their daily life. Therefore, we run 85 OLS regressions (5 communities times 17 variables) in which we regressed the change in individual behavioral and psychological variables over time on their initial value (wave 1) on different samples, each sample being a single community.

In order to reject the peer effect hypothesis, we should observe that each regression yields a non-significant coefficient for the dependent variable. The table below summarizes the results of the regressions. Our variables of interests are reported on rows, communities on columns. Shaded cells indicate non-significant coefficients of initial level (likely to be associated with non-occurrence of peer effect), white cells indicate significant coefficients. The large majority of coefficients (70 out of 85, namely 82%) is non-significant, thus reinforcing our hypothesis that convergence occurs mostly across communities, as a general effect of love based rehab treatment rather than individual communities' peer effect.

Table 13 Significance of coefficients of initial values on psychological and behavioral variables, when regressions are run within each community.

	AR	CL	PT	FR	TN
esteem					
dictator					
idr3_1					
idr3_2					
idr3_3					
ultimatum					
trust					
exp_neg					
exp_pos					
mullet_1					
mullet_2					
mullet_3					
mullet_4					
mullet_5					
mullet_6					
mullet_7					
gratitude					

A different test can alleviate the statistical weakness of the above estimations, due to the small number of agents in some communities. The test works as follows: for each agent, we regress the change in individual psychological and behavioral variables on the initial levels in wave 1, limiting the sample to members of communities different from one's own. The results largely confirm the relevance of convergence irrespective of peer effects[5].

[5] Detailed statistics available on request.

5. Learning and ways ahead

The findings lead us to conclude that:

- rehab communities based on love and forgiveness, as confirmed by in-depth interviews and initial textual analysis, are effectively changing individual behaviors and personality traits;
- individual changes exhibit a significant path of convergence;
- the research instruments we developed and implemented in the present pilot study, despite some limitations, are adequate to detect such change.

Moving towards the implementation of the Research Project along the lines summarized in the Research Proposal recommended by the Social Sciences FAC during its April 24-27 2012 meeting, we plan to:

- Increase the sample size (positive contacts have already been established with *Comunità Papa Giovanni XXIII*, a nation-wide network of rehab communities)
- Increase the time distance between waves, moving to the nine months interval as suggested by community managers and staff as the relevant time span for assessing change in non-dropout agents
- Increase the number of observations in order to allow for possible non-linearities in the evolution of behavioral parameters and psychological traits.

APPENDIX

Arezzo	ex-addicted	love, forgiveness, brotherhood, respect, suffering, communion, patience
	social worker	brotherhood, love, equality, benevolence, healing, passion, smile
	director	communion, courage, humility, heart, dream, chaos, unity,
Caltanisetta	ex-addicted	honesty, respect, forgiveness, understanding, work, tenacity, motivation
	social worker	hospitable, familiar, un-intrusive, understanding, professional, serious, helpful
	director	relation, team, community, love, culture, respect, falling in love
Frosinone	ex-addicted	joyful, demanding, strong, current, without a penny, supportive, charitable
	social . worker	hospitable, love, change, commitment, seriousness, truth, humanity
	director	potentiality, family, person, communion, healing, Gospel, hope
Pistoia	ex-addicted	love, forgiveness, sharing, altruism, gift of oneself, respect, prayer
	social worker	joy, love, truth, humanity, underworld, healing, Jesus
	director	love, unity, communion, confidentiality, helpfulness, understanding, authoritativeness
Trento	ex-addicted	faith, courage, friendship, gift of oneself, cheerfulness, hassle, steady commitment
	social worker	love, hospitality, home, change, freedom, toil, strength
	director	love, family, professionalism, transparency, personalized attention, professional growth, quality

Table A1 English translation of Table 10