Areas of intervention for genetic counselling of dementia: Cross-cultural comparison between Italians and Americans

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Abstract

Objective: Purposes of this study are: (1) to evaluate attitudes, beliefs and experiences towards dementia among relatives of Italian familial cases; (2) to perform a cross-cultural comparison between Italian and American samples; (3) to identify predictors of intentions to undergo hypothetical genetic testing.

Methods: Participants were 134 relatives of patients affected by familial forms of dementia. We administered tests measuring health psychological styles, social variables, illness perceptions, intentions regarding genetic testing, and perceptions of the pros and cons of genetic testing.

Results: Respondents had a poor Alzheimer's disease knowledge and a low perceived dementia threat. When compared to Americans, Italians reported greater willingness to undergo genetic testing and perceived a different subset of benefits and risks. The strongest predictors of test intention were decisional balance, homemaker status and two beliefs concerning dementia causes.

Conclusions: Italians had a poor knowledge of the disease and a low awareness of personal risk of developing dementia. As compared to Americans, they expressed higher intentions to undergo genetic testing and they have a different perception of benefits and risks.

Practice Implications: Understanding of cultural differences in knowledge, attitudes and perception of the disease is important to design optimal health services and education programs for dementia.

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1. Introduction

Molecular genetics of neurodegenerative diseases have identified three genes responsible for autosomal dominant familial Alzheimer's disease (FAD): amyloid precursor protein (*APP*), Presenilin 1 (*PSEN1*), Presenilin 2 (*PSEN2*) genes, and, in addition, the *MAPT* gene for familial

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frontotemporal dementia (FFTD) [1–3] thus raising the possibility of predictive and diagnostic genetic testing [4].

In contrast to these genetic alterations characterized by an autosomal dominant pattern of inheritance with an age-dependent penetrance, the identification of risk factors for Alzheimer's disease (AD), among all the *APOE* ε4 allele, has introduced the possibility of genetic susceptibility testing [5–7]. Predictive genetic tests for patients and their relatives, can potentially provide the possibility: (1) of accessing improved diagnostic procedures; (2) of developing future plans for later life; (3) of benefiting from advanced pharmacological treatments to prevent, or cure, dementia. However, public debate has not yet clarified the controversial ethical issues about the prospect of performing predictive genetic tests in asymptomatic healthy individuals at risk for developing dementia: a number of risks to such testing need to be considered including psychological effects (i.e. appearance of depression, suicide intention), prenatal diagnosis and testing of children, impact on insurances and employment, legal aspects, possible third-party coercion and an understanding of test's limitations [8,9].

Previous studies on diseases with a prominent pattern of inheritance, such as Huntington disease and cancer, showed that the choice to undertake predictive genetic testing is influenced by the social, demographic, and psychological features of subjects involved in the counselling process [10–14]. Relatively little is known about public attitudes regarding genetic testing for AD. Among the general population, intentions to take a predictive test are generally higher in family members of AD patients [15] although it has been reported that many persons, both at risk and not, would not favour testing because of concerns about the effects of unfavourable results on children, spouses, or themselves [16–18]. Some studies have examined which factors influence intentions to take a predictive genetic test for AD: the most important reasons for seeking testing were informing later-life decisions, planning future AD care, spending more time with family, addressing financial issues and purchasing long-term care insurance, helping basic research [16,18–23]. Previous studies investigated racial differences in perception of AD [24] and attitudes toward genetic testing [22] between white and African Americans: these studies demonstrated that race is an important variable influencing illness perception and intentions to undergo genetic testing. To design optimal health services and education programs for dementia, it is important to understand cultural differences in knowledge, attitudes and perception of the disease.

The goals of the present study are: (1) to evaluate attitudes, beliefs and experiences towards dementia among first and second-degree relatives of Italian familial cases; (2) to perform a cross-cultural comparison between an Italian sample here assessed and an American sample previously described [18,19]; (3) to identify which factors might predict the reported intentions of Italian relatives to undergo genetic testing for dementia.

2. Methods

2.1. Participants

We enrolled first and second-degree relatives of patients from families in which there were at least two affected individuals. Patients were consecutively assessed at the Memory Clinic of IRCCS ''Centro S. Giovanni di Dio-Fatebenefratelli'', Brescia (Italy) from 1998 to 2001. Patients were affected by AD (65.6%), frontotemporal dementia (FTD) (15.6%), mild cognitive impairment (11.2%) and vascular dementia (7.6%). In recruiting participants, we adopted the following criteria: (1) for each pedigree, the main caregiver was asked to contact other family members and inform them about the opportunity to be involved in the study; (2) subjects with any psychiatric or cognitive disorders were excluded. From this first screening, we identified 67 eligible families for a total of 246 relatives who were potential subjects for this study. Of these, 112 of the potentials subjects (45.53%) declined to participate: those who declined to participate were significantly older, less educated, and more likely to be siblings of patients than adult children of patients. After obtaining informed consent, 134 relatives from 54 families were recruited. Concerning the American sample, strategy of recruitment and detailed socio-demographic characteristic are reported elsewhere [18,19].

2.2. Measures

2.2.1. Psychological and social assessment

The following personality assessment tests were administered: *Beck Depression Inventory* (BDI) [25], *State-Trait Anxiety Inventory-Y* [26] (STAI), *Big Five Questionnaire* (BFQ) [27]. Health psychological styles were assessed using: the *General Health Questionnaire* (GHQ) [28], the *Information Seeking Style* (ISS: monitoring and blunting) [29], and the *Health Locus of Control* including Internal, Power Others and Chance-Health Locus of Control (IHCL, PHCL, CHCL) [30]. Social factors were assessed with the *Social Problems Questionnaire* (SPQ) [31] and the *Stressful Life Events Questionnaire* (SLEQ) [32].

2.2.2. Dementia illness representations, intentions, and decisional balance

Attitudes, beliefs, and experiences towards dementia and dementia testing were evaluated by a set of previously published [18,19] tests, investigating the following psychological constructs: (1) *dementia illness representations* (including AD knowledge, dementia related distress, dementia treatment optimism, perceived dementia threat, dementia cause beliefs); (2) *test intentions*; and (3) *decisional balance* (including perceived benefits and perceived limitations and risks). Selection of measures was done with the aim of comparing the Italian sample with the American one previously described.

2.3. Data analysis

Descriptive statistics characterized the sample in terms of (1) socio-demographic and psychological features; (2) attitudes and beliefs regarding dementia. *t*-Tests, χ^2-tests, or Fisher's tests were used to compare these variables, correcting for age, gender and education and applying Dunn-Šidák correction when required. Regarding instruments not previously validated in the Italian population, we evaluated the internal consistency by Cronbach's α coefficient. Intentions to undergo genetic testing were rated by six different scenarios, each on a 7-point Likert scale. The scenarios are meant to investigate subjects willingness to take the test, asking them to imagine that certain conditions are met. According to the first scenario, testing is free, medications that can alleviate AD symptoms are available, but not that cure, or prevent the disease; a negative test means that subject' risk is average (15%), while a positive one implies that this grows to 50%. According to the second scenario, the conditions are the same, but the likelihood of developing the disease goes up to 75%; and, in the third scenario, this likelihood is perfect (100%). According, to the fourth scenario, most conditions are still the same, but a positive test result indicates the likelihood of developing AD, in the next few years. The fifth scenario asks to imagine that the test costs €200 and that you have to pay for it. According to the sixth scenario, the test is not genetic, but it is a neuroimaging one, while the seventh hypothesises the availability of a treatment delaying AD onset by 1 year. The computation of Cronbach's α among the six scenarios scales was found to be as high as .94, allowing us to collapse the six scores into a single composite score, ranging from 6 to 42. Because of the asymmetric and irregular distribution of the composite score, we clustered it into quartiles and the obtained ordinal dependent variable was regressed against potential predictors by means of a proportional odds model with cumulative logit link. In addition to the $(k - 1)$ sets of regression parameters, there are also $(k - 1)$ cut points estimated for the k possible outcomes. The exponentiated regression coefficients are interpreted as the odds of being in category k or lower. The response curves all have the same shape; the effects of covariates are assumed to be the same for each of the cut points. In order to restrict the pool of potential predictors, Hosmer and Lemeshow's [33] recommendations were followed: we first evaluated the bivariate associations between each of the investigated variables and the newly created "intentions" variable, then a smaller set of predictors, comparing the fit of some models through a guided stepwise selection procedure, were selected.

In addition, since the relatives could belong to the same family, data analyses were performed taking into account the eventual within-family correlation. For such a purpose, the above *t*-tests, χ^2-tests, Fisher's tests and regression analysis were applied within a generalized estimating equation (GEE) frame; for regression analysis we specified, as working correlation matrix, the exchangeable option.

Finally, the independent working correlation (assuming a null family-effect) was also applied for a better comprehension of the findings.

Analysis of data was done using the SPSS 10.1 and the Sudaan software (http://www.rti.org/sudaan/).

3. Results

3.1. Italian sample descriptions

3.1.1. Demographic, psychological and social variables

Italian participants were mostly in the fifth decade of age (mean age: 47.5 ± 11.1), matched for gender proportion (female: 57%), having children (64%), employed (84%), and mainly caregivers (58%). The large majority of participants (78%) were first-degree relatives (children, $n = 83$; siblings, $n = 22$), thus having a high genetic risk.

The mean score was less than 10, indicating overall absence of depressive disorders; *STAI* measures as well as all personality dimensions (*BFQ*) were in the normal range (data not shown). Considering social features, the *SPQ* revealed absence of social problems in 69.6% of subjects interviewed. On the other hand, the *SLEQ* score indicated presence of one stressful event in the last year for the majority (83.6%) of subjects. Regarding health psychological styles the mean score of *GHQ* (mean ± S.D.: 1.1 ± 2.0) highlighted a normal emotional health status of participants. On the *ISS* measures, subjects showed a higher score on the *monitoring* (mean ± S.D.: 5.1 ± 2.9) than on the *blunting* (mean ± S.D.: 1.5 ± 1.7) dimension. Among the *health locus of control* scales, the *IHCL* (mean ± S.D.: 25.4 ± 3.7) and the *PHCL* (mean ± S.D.: 23.5 ± 3.8) measures were both higher than the expected median value of 21, while the (mean ± S.D.: 19.7 ± 4.9) score was slightly lower.

3.1.2. Illness representations

Regarding *AD knowledge* (Table 1), the mean score was 7.3 or 52.4% correct.

Specifically, 93.2% of participants gave correct answers to the question if AD is fatal, while 78.0% of them answered incorrectly to the item "Most cases of AD are hereditary or inherited". In the *dementia cause beliefs* test, subjects considered "genetic make-up" and "not keeping the mind active" as the two most important causes of dementia (Table 1). In the *dementia related distress* scale (Table 1), 52.3% of participants referred to have, at least sometimes, "intense emotions" about having a close relative affected by Dementia. Six items of *dementia treatment optimism* (Table 1) measured optimism about the future of dementia treatment, prevention and improvement in symptoms in the next 5 years and in lifetime. The majority of Italian participants rated all the items as somewhat, or very likely. Of note, the improvement in symptoms during lifetime was judged as the most probable scenario. Concerning *perceived*

Table 1
Illness representations

Items	% of respondents endorsing response (Italian sample)			% of respondents endorsing response (US sample)		
	Not important	Somewhat important	Important	Not important	Somewhat important	Important
AD knowledge[a,b,c]						
AD cause beliefs						
Genetic make-up[d,e]	10.2	28.3	61.5	4.6	14.9	80.5
Not keeping an active mind[e,f]	11.4	36.6	52.0	37.4	27.7	34.9
Brain chemistry[e,f]	26.7	34.5	38.8	7.8	19.7	72.5
Stress	32.5	35.8	31.7	54.6	26.2	19.4
No prevention for dementia	45.5	25.2	29.3	45.1	30.0	24.9
Diet, nutrition	33.3	40.7	26.0	36.8	30.1	33.1
God's will	61.7	14.2	24.1	56.8	14.1	29.1
Toxic materials	56.3	31.9	11.8	54.2	25.0	20.8

Items	% of respondents endorsing response (Italian sample)			% of respondents endorsing response (US sample)		
	Not at all	Rarely	Sometimes/often	Not at all	Rarely	Sometimes/often
Dementia related distress[g,h]						
Intense emotions	31.8	15.9	52.3	27.0	17.3	55.7
Intrusive imagery	37.9	21.2	40.9	37.4	28.7	33.9
Other things keep thinking	39.4	25.8	34.8	25.5	29.6	44.9
Sleep difficulties	42.4	25.8	31.8	55.1	19.9	25.0
Intrusive thoughts	38.6	28.0	33.4	23.6	11.3	65.1
Reminders of feelings	44.0	28.0	28.0	24.1	23.6	52.3
Dreaming of it	80.0	9.2	10.8	75.5	14.3	10.2

Items	% of respondents endorsing response (Italian sample)			% of respondents endorsing response (US sample)		
	Not likely	Somewhat likely	Very likely	Not likely	Somewhat likely	Very likely
Dementia treatment optimism[i]						
Cure/next 5 years	41.7	46.2	12.1	67.7	27.7	4.6
Prevention/next 5 years	25.8	50.8	23.4	32.7	38.8	28.5
Improvement in symptom relief/5 years	21.1	47.0	31.9	20.4	38.8	40.8
Cure/participant lifetime	14.4	49.2	36.4	29.1	34.2	36.7
Prevention/participant lifetime	10.6	48.5	40.9	16.2	23.0	60.8
Improvement in symptom relief/lifetime	4.5	43.2	52.3	9.2	20.4	70.4
Perceived dementia threat[j,k]						
Likely to develop dementia/5 years	68.7	30.5	.8	80.5	13.8	5.5
Concerned to develop dementia/5 years	53.4	21.4	25.2	71.4	19.9	8.7
Likely to develop dementia/lifetime	32.6	55.0	12.4	26.2	38.5	35.3
Concerned to develop dementia vs. other diseases	30.3	50.0	19.7	31.1	34.2	34.7
Concerned to develop dementia/lifetime	28.0	11.4	60.6	18.4	29.6	52.0

Items	% of respondents endorsing response (Italian sample)			% of respondents endorsing response (US sample)		
	Littlebit stressful	Somewhat stressful	Very stressful	Littlebit stressful	Somewhat stressful	Very stressful
Perceived dementia threat						
Developing dementia: emotionally stressful	22.7	37.9	39.4	5.1	23.5	71.4
Developing dementia: financially stressful	39.4	32.6	28.0	25.0	28.1	46.9

[a] Covariates are age, gender, education, and number-of-affected.

[b] This difference is significant at the multiple comparison corrected $\alpha = .05$ level. Test statistics are *t*-tests.

[c] For Italian sample—Cronbach's α: .73; mean ± S.D.: 7.3 ± 2.8. For US sample—mean ± S.D.: 11.6 ± 1.7.

[d] This difference also holds when corrected for education and number-of-affected variables.

[e] This difference is significant at the multiple comparison corrected $\alpha = .05$ level; the differences were evaluated with Fisher's exact probability test.

[f] These differences hold also when corrected for education variable.

[g] Covariates are gender and number-of-affected.

[h] For Italian sample—Cronbach's α: .82; mean ± S.D.: 13.6 ± 4.6. For US sample—mean ± S.D.: 15.0 ± 5.3.

[i] For Italian sample—Cronbach's α: .87; mean ± S.D.: 19.3 ± 4.7. For US sample—mean ± S.D.: 19.1 ± 5.0.

[j] Covariates are age and gender.

[k] For Italian sample—Cronbach's α: .78; mean ± S.D.: 20.6 ± 5.1. For US sample—mean ± S.D.: 19.1 ± 5.1.

Table 2
Test intentions by hypothetical scenario

Scenarios	% of respondents expressing probable or definitive intentions to seek testing (Italian sample)	% of respondents expressing probable or definitive intentions to seek testing (US sample)
Baseline (99% test accuracy; positive result = 95%lifetime risk)	73.8	59.2
Less test accuracy (85%)	70.8	55.6
Immediate risk	71.5	63.3
Less certain risk information (50% lifetime risk)	70.0	50.3
Available treatment to daily AD onset	77.7	88.8
Available treatment to prevent AD	87.7	95.9
Test intentions total score[a,b]	30.51	28.03

[a] Test intentions total score was calculated by summing up the scores in the six different scenarios.
[b] Difference between the Italian and the American sample is significant ($t = 2.91$; $p = .029$).

dementia threat (Table 1), over 60% of participants did not believe they were likely to develop dementia within the next 5 years. The majority (60.6%) of them were concerned to develop the disease during lifetime, even if only 12.4% estimated this event to be very likely.

3.1.3. Interest in genetic testing

Reported interest in predictive genetic testing, assessed by the responses to six hypothetical scenarios, was high, with percentages of probable and definitive intentions ranging from 70.0 to 87.7% (Table 2). The possibility of gaining information that would allow prevention of future dementia appeared to be the most compelling reason.

3.1.4. Decisional balance

Participants rated benefits more important than limitations and risks ($p < .001$). "Helping research" and "staying on top of future treatment" were considered as the two most important benefits in more than 60% of participants. Concern about "the effect of test results on loved ones" and "worry about children risk" were seen as the most important reasons to decline testing. Perception of test benefits, limitations and risks are summarized in Table 3.

3.2. Cross-cultural comparisons

3.2.1. Demographic, psychological, and social variables

Italian and American samples differed in gender (% of female—Italians: 57%; Americans: 72%), age (mean ± S.D.—Italians: 47.5 ± 11.1; Americans: 53.6 ± 11.1), education (% of subjects with educational level ≥ 13 years— Italians: 22%; Americans: 87%), and number of affected relatives per pedigree (mean ± S.D.—Italians: 3.7 ± 1.8; Americans: 1.9 ± .9). In regard to health psychological styles, the Italian sample had significantly higher scores than the American sample in *IHCL* (mean ± S.D.—Italians: 25.4 ± 3.7; Americans: 20.2 ± 3.2) and in *CHCL* (mean ± S.D.—Italians: 19.7 ± 4.9; Americans: 14.4 ± 3.4). Conversely, the Italian group scored lower in the

monitoring (mean ± S.D.—Italians: 5.1 ± 2.9; Americans: 9.3 ± 2.8) and blunting (mean ± S.D.—Italians: 1.5 ± 1.7; Americans: 3.9 ± 2.0) dimensions of the *ISS*. Differences are significant at the multiple comparison corrected $\alpha = .05$ level (*t*-test). These differences were still statistical significant after taking into account the eventual within-family correlation (GEE analysis).

3.2.2. Illness representations

While the samples were each non-representative, and gathered in different ways, cross-cultural comparison suggested that the *AD knowledge* is lower in the Italian sample. The results of *perceived dementia threat* suggested that Italians were more concerned about developing dementia than Americans, while they had a lower perception and evaluation of their own risk. Additionally, comparing the two groups about beliefs on dementia causes, we found that Italians felt "not keeping an active mind" was a more important cause of dementia than Americans, while the opposite is true for "brain chemistry" and "genetic make-up" (Table 1). These differences were still statistical significant after GEE analysis. Considering the family cluster effect *dementia related distress* was significantly lower in the Italian sample as compared to the Americans ($p = .040$).

3.2.3. Interest in genetic testing

Italians expressed high intentions (more than 70%) in all proposed scenarios independently of test accuracy or availability of a successful treatment. Among the Italian sample, the test intentions total score was significantly higher than among the American sample (Table 2); this difference was not statistically significant after taking into account the family cluster effect ($p = .071$).

3.2.4. Decisional balance

Italian average *benefit score* was significantly lower than the American one. Table 3 shows that, in comparison with Italian relatives, a higher percentage of American participants considered (1) "making later life decision", "planning

Table 3
Decisional balance: perceived benefits and risks

	Mean score	% of respondents endorsing response very important (Italian sample)	Mean score	% of respondents endorsing response very important (US sample)
Perceived benefits total score[a]	26.15 ± 7.91[b]		28.78 ± 6.52	
Perceived benefits				
Helping research		65.6		71.1
Staying on top of future treatment		60.6		78.2
Making later-life decision[a]		53.5		84.9
Planning my future[a]		48.0		80.2
Information about children risk		47.2		49.2
Reducing family worries (test negative)		34.4		41.5
Improvement in quality of life[a]		32.3		48.7
Would please my family		15.7		17.2
Perceived risks total score	17.94 ± 7.19[b]		19.58 ± 6.37	
Perceived risks				
Upsetting my loved ones		30.2		34.9
Worrying about my children risk		28.6		32.1
Treatment and prevention are limited		22.2		33.0
Too upsetting		22.0		27.5
Testing is not worthwhile		15.9		10.3
Chance on insurance companies/employ[a]		6.5		34.5
Changing how other persons look at me		6.3		11.7
Too much money and time		5.7		5.6
Decisional balance	8.16 ± 8.75		9.16 ± 9.43	

[a] Difference between the American and the Italian sample is significant at the familywise α-level of .05. Each comparison has been performed considering age, gender, number of affected and education dummy variables as potential covariates and correcting for one, or more of them, whenever appropriate. The Dunn-Šidák corrections for multiple comparisons have been performed considering as families the perceived benefits items, the perceived risks items, and the perceived benefits, perceived risks and decisional balance total scores.

[b] Difference between perceived benefits and risks among the Italian sample is significant at the α-level of .001.

for the future'' and ''improvement in quality of life'' as very important perceived benefits; and (2) ''chance of a genetic discrimination'' regarding insurance or employment as a very important perceived limitation and risk. These differences were still statistical significant after taking into account the eventual within-family correlation (GEE analysis). Of note, considering the family cluster effect, *Importance of taking preventive medications* results as a more important factor in the American sample as compared to the Italians ($p = .002$).

3.3. Predictors of test intentions in the Italian group

We entered a set of six variables for predicting intentions through an ordinal logistic regression analysis, with an *exchangeable* working correlation matrix. The final model provided a significant goodness-of-fit (Cohen's kappa = .29, $p < .001$). As shown in Table 4, the selected predictor variables in descending order of importance were: *decisional balance, dichotomized profession, dichotomized brain chemistry, importance of taking preventive medications, number of children, educational level*. The last two variables did not reach statistical significance. Table 4 presents the parameter estimates of the cumulative logit regression. For each unitary increase of decisional balance,

the odds of belonging to lower intentions quartiles decreases 13%. ''Being homemaker'' is associated to an odd increase of lower intentions of about eight times with respect to other professions; belief in the importance of ''brain chemistry'' decreases the odds of lower intentions of approximately 70%; the decreasing importance assigned to ''assuming preventive medications'' resulted in an increase of the odd of lower intentions of about 14 times (not important versus very important), 8 times (little important versus very important), 5 times (important versus very important). For each additional child, the odds of lower intentions decreases of about 36%. Finally, the effect of educational level seen in the bivariate analysis, was not confirmed in such multiple analysis, due to its high correlation with the other covariates. It is worth noting that, when the exchangeable working correlation was replaced by the independent one in the GEE regression model, similar findings were obtained, but the effects of the variables more sensitive to the ''family-influence'' resulted overestimated. In particular, ''importance of taking preventive medication'', ''dichotomized brain chemistry'' and ''decisional balance'', although still significant in our model, showed a relevant decrease of the Wald statistic (around 20%), indicating that their effects were partially accounted for by the family clusters.

Table 4
Predicting genetic-testing discrete intentions. Cumulative logit regression analysis: summary table

Variable	Wald (df)	Wald p	β	$s(\beta)$	t-Test	p-Value	Odds ratio	95% CI[a]
Intercept1			−1.70	.96	−1.78	.0813	.18	.03–1.24
Intercept2			.06	1.04	.06	.9508	1.07	.13–8.63
Intercept3			1.97	1.24	1.58	.1190	7.18	.59–87.15
Decisional balance	11.11 (1)	.0016	−.14	.04	−3.33	.0016	.87	.79–.94
Dichotomized profession	10.42 (1)	.0021						
Housewife			2.09	.65	3.23	.0021	8.07	2.20–29.53
Not housewife							1.00	–
Dichotomized brain chemistry	6.36 (1)	.0147						
Important			−1.12	.44	−2.52	.0147	.33	.13–.80
Not important							1.00	–
Preventive medication	2.55 (4)	.0494						
Not important			2.64	.87	3.04	.0037	14.02	2.46–8.01
Little important			2.12	.81	2.60	.0120	8.30	1.63–42.41
Important			1.68	.80	2.10	.0405	5.36	1.08–26.63
Very important							1.00	–
Number of children[b]	2.77 (1)	.1017	−.48	.29	−1.67	.1017	.62	.35–1.10
Education[b]	.73 (3)	.5386						
Primary school			1.08	1.00	−1.08	.2866	.34	.05–2.54
Junior school			.12	.60	.20	.8452	1.13	.34–3.78
High school			.19	.56	.33	.7416	1.20	.39–3.72
University degree							1.00	–

[a] The values of these columns indicate the lower and upper limits of the 95% confidence interval for the odd ratio corresponding to an increase of 1 unit, for the continuous variables and to a change of category with respect to the reference one for the categorical ones. When the unit value belongs to this interval, the odd-ratio is not significant at the 95%-level.

[b] As indicated by Wald-tests and their p-values, the contribution of these variable to the overall model is not significant (see text).

4. Discussion and conclusion

4.1. Discussion

With the recent completion of the sequencing of the human genome, genetic testing will increasingly became available for a greater number of pathological conditions, many of which manifest in adulthood with little or no treatment available. Efforts to understand people's intention to obtain genetic testing for AD are of interest. Understanding cultural differences on these aspects is important in planning of appropriate genetic testing and related counselling services.

We examined socio-demographic and psychological characteristics of the Italian sample. The hypothetical future user of genetic counselling, here depicted, is in general a first-degree relative, caregiver, predominantly a descendant of the affected patient. In regard to socio-psychological features, anxiety, personality dimensions and depression were in the normal range and social problems were generally absent. Concerning health psychological styles, the majority of participants showed a normal emotional health status. They believed in an active control of their health status attributing a minor relevance to chance, resulting in a personal style that seeks information rather than ignores it. Italian respondents had poor global AD knowledge, performing better in items attributable to a direct experience of the disease, regarding knowledge of symptoms or patient care; they were misinformed about dementia causes attributing, for example, a too large importance to

inheritance of the disease. Despite presence of a family history in their pedigree and their dementia cause beliefs, only a small proportion of Italian respondents estimated risk of developing dementia during lifetime as very high. This may help explain the low level of distress symptoms since solely distressing emotions were frequently present in roughly one half of participants.

Comparative analyses with the American sample revealed that the Italian relatives were younger, with a lower level of education and AD knowledge. Of note, Americans estimated the risk of developing dementia during their lifetime as "very likely" three times more commonly than Italians did, despite the presence of sporadic cases in the American group. This higher awareness of disease among Americans is associated with a higher dementia related distress and a stronger perceived emotional and financial stress. A previous study [24] investigated racial differences in perception of AD between white and African Americans: interestingly Italian participants are more similar to African Americans in perception of disease. Both Italians and Americans consider "genetic make-up", "not keeping the mind active" and "brain chemistry" as the most important causes in the development of dementia. Italian relatives are more likely to report that they would choose to undergo genetic testing for dementia than Americans: this difference was influenced by the family cluster analysis, suggesting that intentions to undergo genetic testing might differ among families. Of note, Italians expressed high intentions (more than 70%) in all

proposed scenarios independently of test accuracy or availability of a successful treatment suggesting poor criticism in evaluating the consequences of different scenarios. Intentions to take a test expressed by Italian participants were much higher than those observed in a Dutch sample at risk for FAD because of the presence of a mutation in their pedigree [16]. When considering the opportunity of taking a genetic test, Italian relatives are more motivated by the ideas of helping research and staying on top of future treatment options, while they perceived as a negative consequence upsetting their loved ones. These findings are consistent with what reported by Tibben et al. [16] in another European sample. Conversely, Americans pay more attention to their planning for future life and later life decisions and/or to the possible consequences on insurance policies and employment. These cross-cultural differences probably reflect two different life styles, social systems and health policies: however our findings must be interpreted with caution given the non-representative nature of the analyzed samples. The different selection criteria for the American and Italian samples could have affected the characteristics of analyzed samples: the American participants were paid after completion of questionnaires, while Italians relatives did not. We are inclined to believe that Italian relatives recruited were more motivated and enthusiastic about research. One asymmetrical feature of the study is that Italian and American samples were gathered in different ways and while Italian participants all had two or more family members affected by dementia, American subjects needed only have one family member with AD.

Concerning predictors of intentions to undergo genetic testing for dementia, within the Italian sample, subjects who express a higher intentions to undergo genetic testing showed: (1) a higher decisional balance (seeing more benefits than risks): this could be explained by the fact that anybody is, normally, more likely to get involved with something, seeing more advantages than disadvantages about it; (2) an ''employed'' status versus a homemaker one: housewives are, usually, less eager to embrace novelties than people with a daily dealing with the external world such as genetic testing; (3) a stronger belief in the importance of biological dementia-causing factors; (4) a positive attitude towards preventive medications: genetic testing might provide people having such a belief/attitude with the opportunity of looking into something that they consider important and of taking preventive measures.

Regarding genetic counselling services for dementia, a positive experience in this field was, instead, reported in the USA, with a group of individuals characterized by an autosomal dominant risk for familial dementia [34].

4.2. Conclusion

Knowledge, beliefs and attitudes towards dementia as well as intentions to undergo genetic testing are influenced by cultural background.

4.3. Practice implications

Our data highlight an area that probably needs intervention: because of poor knowledge of the disease and, at the same time, poor awareness of personal risk of developing dementia in during lifetime, Italian relatives might benefit from an informative and educational intervention, favouring a free and responsible choice. The cross-cultural differences arising from the comparison throughout our and an American study might be important to develop appropriate strategies in genetic counselling for dementia in Italy. These findings highlight the importance of creating new mechanism for rapid diffusion of genetic testing information relevant to clinical practice.

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