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The Impact of Culture on the Individual Subjective Well-Being of the Italian Population: An Exploratory Study

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Abstract The aim of this study is to explore the relationship between cultural access and individual psychological well-being, in order to provide a possible estimation of the impact of cultural participation upon subjective perceptions of well being. Our exploratory research was based on a cross-sectional survey undertook on a medium-large sample ($n=1500$) of Italian residents in fall 2008. We refer to the Psychological General Well-Being Index–PGWBI, a tool that has been validated through 30 years of research, as an index of measurement. Moreover, we have administered to the sample an additional questionnaire inquiring about access to 15 distinct culturally related activities. Data are processed by means of a specific methodology based on ANN and Called TWIST. TWIST has been developed by the Semeion Research Center, Rome. Our analysis suggests that culture has a relevant role as a determinant of individual psychological well-being, in that a selected subset of cultural variables turn out to perform among the best predictors of individual PGWB levels. Our results also allow some preliminary considerations about innovative, well-being focused public health policies leveraging upon the human and social developmental role of culture.

Keywords Cultural access · Cultural and health policies · Psychological well-being · PGWBI

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Introduction. Culture and Well-Being: A Multi-Layered Relationship

Relevance of the Study and Conceptual Background

Hardly anyone would be willing to deny the psychologically, socially or economically beneficial impacts of culture, and thus the *indirect* influence that they may exert on issues such as longevity or life satisfaction. But reasoning about culture as a major, *direct* determinant of health or of physical and psychological well being is a less uncontroversial point. This is due to the fact that, compared to other health-relevant factors such as, to name just a few, dietary and smoking habits, genetic endowment, exposure to toxicity or stress, but also level of income or quality of social relationships, culture is often intuitively judged to have a relatively minor impact on significant quantities such as life expectation or (suitably measured) well-being. At most, there may be the recognition that some of these major factors, such as for instance dietary and smoking habits, can be at least in part culturally determined. But again, concern for culture is instrumental to the fact that it turns out to act upon other, *intrinsically* relevant matters.

There are a few exceptions to this state of things. Traditionally, there has been an interest toward these issues in the anthropological or clinical literatures dealing with trans-cultural medicine and other related public health topics (see e.g. Manderson and Allotey 2003; Siegrist 2008). In this case, the very subject of investigation (how cultural differences affect the perception, reception and effectiveness of medical treatments developed in culturally diverse environments) makes it self-evident why cultural factors should matter in this specific context. But also the recently flourishing literature on happiness studies is devoting an increasing attention to the cultural dimension. It should be noted, however, that not only it is the case that terms such as quality of life, well-being and life satisfaction actually identify a maze of closely interrelated but subtly different concepts (Haas 1999a, b; Taillefer et al. 2003) and that the very relationship between subjective and objective levels of well-being may be dynamically complex (Cummins 2000). In fact, the term 'culture' itself is full of semantic complexities and ambiguities. In particular, there are at least three different (layers of) meanings that we can assign to the term. In the first place, we can reason about culture as a bundle of given socio-environmental traits, that is to say, a set of characteristics that are associated to one's own place of human and social development. Clearly, these traits can be purposefully cultivated and evolved to some extent (for instance, one's mastery of homeland traditional singing or hand decoration practices), but it is the very fact of being grown in a specific context that determines their permanent sedimentation both at the individual and at the social level. In this instance, cultural traits are propagated and stabilized at a societal and inter-generational level through the mechanisms of cultural transmission (Henrich et al. 2008). There is a rich literature exploring the well-being implications of cultural socio-environmental traits, starting from the seminal work of Ed Diener and co-authors which has firmly marked the development of the discipline (see e.g. Diener and Suh 2000). An exhaustive discussion of this literature is beyond the scope of this paper, although it is worth mentioning a few interesting contributions as meaningful examples. Diener and Lucas (2000) set a challenging agenda for future research which has led in time to important insights. Ahuvia

(2002) proposes a theory of the re-focusing of subjective well-being determinants as a consequence of economic development that causes a shift from socially- to individually-centered orientations across cultures. Biswas-Diener et al. (2005) provide an illuminating account of inter-cultural differences across samples of individuals coming from relatively small and simple societies, explaining how different cultural environments may elicit different responses on different dimensions and scales. Uchida et al. (2004) find that cultural variation in happiness and subjective well-being affects several dimensions of primary importance, such as the cultural meanings of happiness, the motivational basis of happiness, and the very predictors of happiness, highlighting in particular the tension between the self-centred, individualistic focus that is typical of North American societies and the socially-centred focus of East Asian societies; an analogous result is found by Lu and Gilmour (2004). Sheldon and Hoon (2007) find that subjective well-being is subject to multiple determinants, which also include cultural membership. In a nutshell, then, there seems to be support for the idea that subjective well-being is, among other factors, culturally determined.

A second instance of culture relates to the purposeful acquisition of capabilities and competencies that goes beyond socially transmitted traits, and that are still related to the self-representation and self-determination dimensions that are typically associated with culture, although they are the by-product of the pursuit of goals whose nature is not intrinsically cultural: For example, undergoing a formal education program to acquire the skills that are needed to find a better job on the labour market, or developing cultural traits that are functional to a better social integration. Unlike socio-environmental cultural traits, in this case the acquisition of cultural traits is the outcome of specific decisions of investment in the accumulation of human capital, but for motivations that give to culture an instrumental value. One again, there is a literature that tries to evaluate the well-being implications of relatively high values of acculturation or educational accomplishment. Also in this case, we find interesting sources of supporting evidence on the relevance of instrumentally-motivated and acquired cultural traits. Carlisle et al. (2008) show in some detail how the availability of relatively high levels of cultural resources allows individuals to construct in more articulated and sophisticated ways, as well as to justify and legitimate, their strategies for the development of lifetime goals and tastes, thereby attaining higher levels of psychological well-being. Zheng et al. (2004) show that, among Chinese students in Australia, the level of acculturation has a quite noticeable impact on subjective well-being. Rosengren et al. (2009) find evidence of clinical implications, showing, on the basis of a large sample from 52 different nations covering very different cultural contexts (in the socio-environmental sense) that, in high income countries, high levels of education and other forms of socio-economic status imply a substantially lower risk of acute myocardial infarction. The effect is considerably weaker in low- and medium-income countries. One can rationalize this relatively strong relationship between instrumentally acquired cultural traits and well-being and health related variables in terms of the capabilities and functionings approach of Sen (1999). Higher levels of education and acculturation allow individuals to make better informed and self-conscious choices, which have a positive impact in terms of self-determination and health-serving habits and practices.

The fact that socially inherited cultural traits and the education and acculturation background can affect positively one's subjective well-being or vulnerability to specific morbid factors is far from obvious but, as a matter of principle, not entirely surprising. After all, the ways in which choices and their consequences are constructed, managed and perceived are clearly filtered through cultural lenses, and this cannot but bear upon well-being and morbidity. But there is a further instance of culture for which these conclusions are less natural. We refer to culture as the acquisition of purposefully constructed traits that have to do with intrinsic cultural motivations, that is to say, capabilities and competences that are targeted at a better access and enjoyment of cultural experiences, that is to say, experiences that are explicitly and uniquely designed by someone to expose other individuals to particular statements and trajectories of meaning. In other words, we refer now to cultural activities that are organized into specific cultural arenas, markets, and industries. The relationship between well-being and this rather restrictive meaning of culture is more puzzling than for the previous instances of the term, in that we are accustomed to think of cultural experiences in terms of leisure and entertainment, that is to say, activities that are certainly beneficial to one's good humour and easiness of mind, but that are unlikely to cause major consequences on well-being, life satisfaction, or health, when compared to factors such as morbidity, lack of socialization, or low levels of income. This orientation, however, relies upon a rather restrictive and misleading view of the sense and importance of cultural experiences in the restrictive sense. Cultural experiences may be much more than a nice way to spend one's free, leisure time. They may be important platforms for the development of individual dispositions and capabilities that may substantially expand the potential of self-determination, the strategies for the pursuit of life satisfaction, the articulation and adoption of lifestyle choices, and so on.

Literature Review

The existing evidence seems to confirm the relevance of cultural experiences in terms of health and well-being indicators. The literature contains a number of studies that seem to provide clear and solid evidence (including clinical one) that the participation to cultural activities (in the most restrictive sense pointed out above) is beneficial for health. For example, there is evidence on the relationship between cultural attendance and life expectation, showing that cultural access clearly improves chances of survival in longitudinal samples. A 14-year longitudinal study (Koonlaan et al. 2000) investigated the possible influence of attending various kinds of cultural events or visiting cultural institutions as a determinant of survival. The study found a higher mortality risk for those people who rarely went to cinema, concerts, museums, or art exhibitions, as compared with those visiting them most often. Less beneficial effects were found for attendance of theatre, church service or sport events as a spectator, and no effect at all from reading or music making. Furthermore, Hyppa et al. (2006) undertook a study concerning cultural participation as a predictor of survival on a sample of 8.000 Finnish, and observing a lower risk of mortality among frequent attendees. In a similar vein, Bygren et al. (2009) have examined the relationship between attendance of cultural events and cancer-related mortality. The results of their longitudinal study on more than 9000 participants

found that those who were rare or moderate attendees were, respectively, 3.23 and 2.92 times more likely to die of cancer during the follow-up period than frequent attendees. However, this effect was observed only among residents of urban areas.

As to the relationship between culture and individual well-being, recent studies have again provided some interesting insight. Daykin et al. (2008) have carried out a literature review to explore the evidence for the impact of performing arts on the health and well-being of young people in non-clinical settings. They found evidence of positive effects of performing arts practice, including positive changes in reported behavior and improvements in social skills and interaction among young people at risk. Evaluating the impact of participatory art projects for people with mental health problems, Hacking et al. (2008) found that participation led to significant improvements in empowerment, as well as in mental health indicators and social inclusion. However, the actual relationship is likely to be more complex and multi-faceted than one could infer from these preliminary pieces of evidence. Michalos (2005) and Michalos and Kahlke (2008), in two pioneering investigations, have measured the impact of the arts on the quality of life. In the first one, a randomly drawn household sample of 315 adult (18+) residents of Prince George British Columbia (CA) served as the working data set. A mailed-out questionnaire identified 66 arts-related activities and obtained information on the respondents' average weekly and yearly participation rates, as well as on levels of satisfaction from participation. Summarizing the multivariate results, it turned out that the arts have a very small impact on QOL, and could only explain from 5% to 11% of the variance in four plausible measures of the self-perceived quality of respondents' lives (Michalos 2005). In the second study, in order to measure the impact of arts-related activities on the perceived or experienced quality of life, a questionnaire was distributed to over 10,000 households across five communities in British Columbia. The questionnaire again asked questions regarding participation in 66 kinds of arts-related activities and people's motives for engaging in such activities, and measured respondents' overall assessment of their health, satisfaction with life and quality of life, happiness, contentment and subjective well-being. A total of 1027 questionnaires (10.3%) were returned completed, which was not considered to be a representative sample of the local communities under study, but only of residents with an interest in the arts. The study findings indicated that arts-related activities, and the satisfaction obtained from those activities, had relatively little impact on the respondents' perceived or experienced quality of life (Michalos and Kahlke 2008). Nummela et al. (2008), however, find that, on the basis of a postal survey conducted on about 2,800 individuals belonging to three different demography cohorts and living in a district in South Finland, there is a strong and consistent association between various forms of cultural attendance (art exhibitions, theatre, movies and music concerts) and self-reported health. Laukka (2007) also finds significant associations between certain practices of music listening and psychological well-being in a sample of elderly (65–75) Swedes.

Purpose of the Study

These preliminary results suggest that more research needs to be carried out to achieve deeper insights and better understanding on the relationship between access

to cultural experiences and well-being, quality of life and reported health. Contrary to what has happened for extensive, socio-environmental interpretations of culture, the number of studies that have investigated the impact of (participation in or consumption of) cultural experiences on the QOL/well-being of individuals is still too small. Moreover, none of the existing studies has been based on a statistically representative sample. Furthermore, the available studies have found in some cases controversial results, in spite of the fact that other available evidence suggests that cultural access may be beneficial for health. Therefore, some clarification is needed by means of further, newly designed data collections and analyses.

This paper addresses the question of the impact of participation in, and consumption of, cultural activities on individual perceived well-being, asking in particular whether cultural access may serve as an effective predictor of individual psychological well-being. The choice of a predictive approach allows us to start reasoning, although in a very tentative and preliminary way, in terms of causation, and not of simple association. Should we find that cultural habits are indeed effective predictors of psychological well-being, and combining these results with the already existing evidence about the impact of culture on life expectancy, we would thus have a promising empirical platform to construct a model that illustrates in some depth and explains this connection, thereby providing further insights and avenues for new empirical research.

The rest of the paper is organized as follows. Section "Methodology" presents the methodology. Section "Results" illustrates the main results. Section "Discussion and Conclusions" contains a final discussion and the conclusions. Appendix 1 provides a more detailed presentation of the statistical tools adopted. Appendix 2 provides some additional details about the survey questionnaire.

Methodology

Our cross-sectional survey assessing the modes and intensity of access to cultural experiences, and its relation with psychological well being, has been conducted on a relatively large sample (n=1500) of Italian residents living in non-isolated areas, i.e. being exposed to some degree of continuing community life. The survey has been conducted with the assistance of Doxa, an Italian pollster company, through telephone interviews, according to the CATI system. The sampling universe is that of the National Statistical Survey, carried out on year 2001 by ISTAT—the Italian National Statistical Institute that covered 57 million of Italians from all regions, stratified according to region and size of the town or city of residence. A multi-step random sampling method was adopted to draw a large representative sample from the Italian population.

Our sampling universe, as a subset of the aforementioned National Survey, consisted of 49.2 million Italians from all regions, aged 15 years or more, and stratified according to region and population size of the place of residence. The sampling units were chosen as follows: In the first stage, the choice regarded the municipalities where the interviews took place; in the second stage, in each selected municipality, an adequate number of electoral wards were extracted at random so that various types of urban areas were represented (e.g., central, suburban, outskirts

and isolated houses); finally, names and addresses of the persons to be contacted were extracted at random from the electoral lists of the areas selected in the second stage. Mean scores for all items, as well as the global summary measures, were calculated according to the chosen algorithm (see below), and weighted by gender, age and size of the municipality with reference to the sampling universe.

Our survey collected information covering socio-demographic and health-related data that are widely recognized as relevant determinants of well-being: geography (North, Center, South quadrants of the country), environment (urban, semi urban, rural environment), gender, age, schooling (no school, primary, secondary, high school, college), civil status (single, married, widow, divorced/separated), monthly income level (<1.000 Euros, 1.000–1.500 Euros, 1.500–2.500 Euros, >2.500 Euros, no data) presence/absence of diseases from a given list (see Appendix 2 for more details).

In addition, 15 different variables related to cultural access have been added, after a scrutiny of the relevant literature in the cultural field; such variables are to be jointly meant as a proxy of individual levels of 'cultural access' (Table 1).

Each subject being surveyed in the study had to go through a structured questionnaire asking about the daily frequency of access to all of the activities listed in Table 1. The intensity of access to a specific cultural activity could thus be measured on a quantitative scale ranging theoretically from 0 to 365.

The Psychological General Well Being Index (PGWBI)

The level of subjective psychological well being has been measured by means of an index that has been validated by decades of clinical practice: The Psychological General Well Being Index (PGWBI). The PGWBI has been developed as a tool to measure self-representations of intra-personal affective or emotional states reflecting a sense of subjective well-being or distress, and thus captures what we could call a subjective perception of well-being (see Dupuy 1990 for a general presentation and a

Table 1 Cultural activities considered in the survey

Jazz music concerts
Classical music concerts
Opera/ ballet
Theatre
Museums
Rock concerts
Disco dance
Paintings exhibitions
Social activity
Watching sport
Sport practice
Book reading
Poetry reading
Cinema
Local community development

historical account of its development). The original PGWBI consists of 22 self-administered items, rated on a 6-points scale, which assess psychological and general well-being of respondents in six HRQoL domains: anxiety, depressed mood, positive well-being, self-control, general health and vitality. Each item has six possible scores (from 0 to 5), referred to the last four weeks of the subject's lifetime. Each domain is defined by a minimum of 3 to a maximum of 5 items. The scores for all domains can be summarized into a global summary score, which reaches a theoretical maximum of 110 points, representing the best achievable level of well being (Dupuy 1990), a sort of 'state of bliss'.

In this survey, we have adopted the short form of PGWBI, consisting of a subset of six items that generally explain more than 92% of the global variance of the questionnaire. The full PGWBI (the 22 items version) has been adopted in two previous waves of research about the well-being of Italian population (2000 and 2004). This short version has been validated in a long-term project carried out from 2000 to 2006 in Italy (Grossi et al. 2006). We have added reporting upon cultural access data in a specific section of the questionnaire, and information collected through the interviews has been phrased in quantitative terms (i.e., answers elicited quantities such as the number of times per year that the respondent participated to any given activities). In principle, we could have also worked upon qualitative data, by suitably restating them in quantitative terms (e.g. as self-reported levels of satisfaction for a given item on a 10-point scale). In the present research, however, only quantitative elements—frequency of participation to culture-related activities—have been considered.

Data Analysis

As already remarked, the sample selected for the analysis (Italy, $n=1500$) is relatively large, as it is required by the nature of the research question, to allow enough variability to make meaningful inferences as to the predictive capacity of the single variables. Univariate analysis has been carried out on the PGWBI mean values as related to different levels of cultural access. Means have been compared with unpaired *t*-tests. Multivariate analysis has been carried out with supervised artificial neural networks, according to the method already adopted in Penco et al. (2008). The choice of a relatively unusual and sophisticated inferential technique such as Artificial Neural Networks (ANNs) is motivated by the fact that the underlying relation to be estimated among our independent sample variables and the dependent variable (the PGWB total score) is extremely complex and there is no reliable a-priori statistical model to refer to. ANNs self-adjust their structure as they learn from their own errors, and can handle simultaneously a very high number of variables, irrespectively of their underlying degree of non-linearity, and this leads to structurally robust results even when the underlying statistical process is not well understood, thereby allowing to cope with many sources of inferential inaccuracy such as outliers, collinear interactions among variables, hidden variables, and so on (Buscema 1998).

In particular, we work with the family of Supervised ANNs, that is to say, with ANN that address problems where an external, objective target output can be fixed, so that they learn by examples (the training set, that is, a suitable sub-sample of the

whole database), calculating an error function during the training phase, and adjusting the connection strengths in order to minimize the error function until a satisfactory and stable level of accuracy in the prediction/classification task is reached. This type of ANNs thus computes a function of the form: $y = f(x,w^*)$, where x is the input, y is the output and w^* is the set of ANN weights (the function parameters) that encode the ANN's approximate reconstruction of the structure of the function.

In order to cut down of the number of irrelevant variables in the database (i.e., the variables that do not carry any meaningful information for the prediction task), which cause a loss in the power of our inferences, we have employed a special 'artificial organism' called TWIST (Buscema 2005), suitably designed for sorting out the most relevant variables for the sake of prediction/classification. It consists of a combination of two already known systems: T&T and IS. The T&T system is a robust data re-sampling technique that is able to arrange the source sample into sub-samples, all of which possessing a similar probability density function. In this way, the database is split into two or more sub-samples in order to train, test and validate the ANN models as effectively as possible on the basis of the available data. The IS system is an evolutionary 'wrapper' system that selects variables in order to minimize their number while preserving the actual amount of task-relevant information contained in the data-set. The combined action of these two systems allows us to increase substantially the inferential power of our ANN system, while circumventing at the same time a few major technical issues. Both systems are based on a Genetic Algorithm, the Genetic Doping Algorithm (GenD) developed at Semeion Research Centre, Rome (Buscema 2004). The TWIST system is described in detail in the appendix, and Fig. 1 below is a snapshot of TWIST at work during the variables selection task.

The TWIST pre-processing singles out the variables that prove to be most significant for the prediction/classification task, while producing at the same time the training set and the testing set, which are extracted from a probability distribution which is very close to the one that provided the best performance in the task. As to the prediction/classification task, it is carried out by means of a supervised, Multi Layer Perceptron, with four hidden units (Haykin 1998).

Results

Sample Description

The sample consists of 779 females and 721 males. The mean age of the sample was 46.54 years (17.24 SD); the range was 15–92 years. The values of the reduced version of the PGWBI were rescaled in the 0–110 range according to an algorithm described in Grossi et al. (2006), in order to allow historical comparison with studies employing the 22 items version. The average value of PGWBI in the overall population resulted to be 77.76 (17.73 SD); the range, 4–110. The average value is almost identical to those recorded in previous surveys carried out in 2000 and 2004 (78.0). As expected, the average PGWBI value resulted higher in males as compared with females (80.95 vs. 74.81 respectively). Table 2 shows the characteristics of the

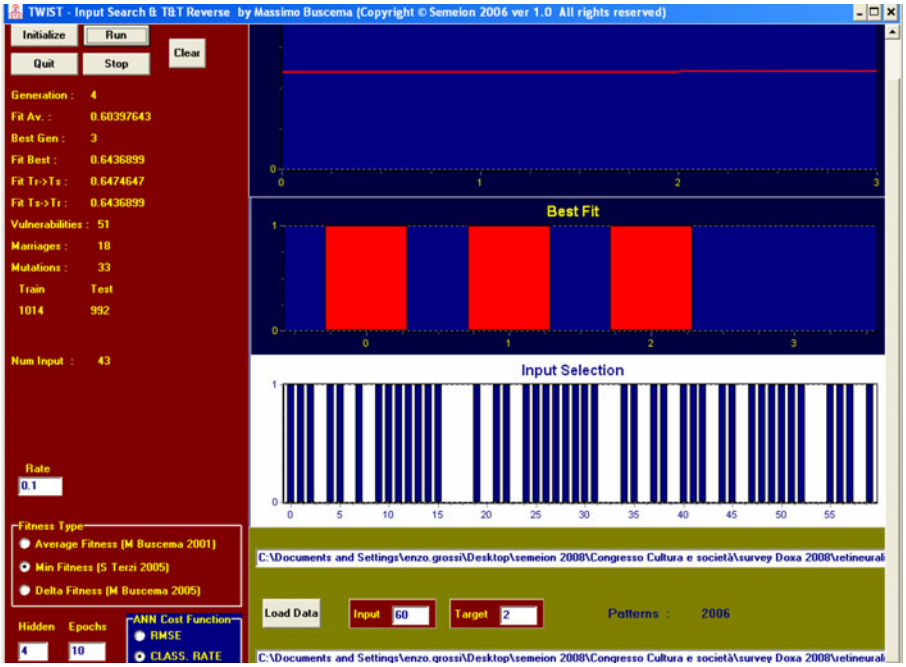

Fig. 1 The TWIST system

Table 2 Sample characteristics

	N	%	Italian population istat %
GENDER			
Male	726	48	48
Female	779	52	52
AGE GROUPS			
15–17	53	3.5	3.5
18–34	397	26.4	24.2
35–54	507	33.7	35.0
55 +	548	36.4	37.3
DEGREE			
Primary/Junior School	909	60.4	56.6
High School	469	31.2	32.7
College	126	8.4	10.7
GEOGRAPHICAL AREA			
North	690	45.8	45.8
Center	295	19.6	19.8
South	520	34.6	34.4

sample of our study, as compared to the general Italian population structure as resulting from the national survey of 2001.

Univariate Analysis

The univariate analysis shows the influence of descriptive variables considered in the survey on PGWBI (Tables 3a–c). As expected, an inverse linear relationship between age and PGWBI emerges in our sample. However, despite this clear trend in absolute mean values, the differences don't reach easily statistically significant levels. In fact, differences become statistically significant starting from age 40 versus age 15–17, and from age 50 vs. 18–20. Thus, age is important for PGWBI changes, but big overlaps take place. What about gender? Male subjects feel on average better than females, with a six-points difference in mean PGWBI. This difference in favor of males is statistically significant despite the absolute difference is lower than in age setting values. The same is true for income: People with less than 1.000 euro per month of income show PGWBI values statistically lower than all other levels of income, which don't show statistically significant differences among them. Thus, income levels beyond a certain threshold do not seem to play a major role in the perception of well-being. Job categories are associated with a wide range of well being values, with average PGWBI ranging from around 70 in the case of farmers or unemployed people, to 84 for managers. Also in this case, the variation in scores is so large that no statistically significant difference emerges. The same is true for civil status and schooling and education, again due to a huge variation hampering the expected absolute differences among variability classes for each given variable.

The effect of geography is marked, with a clear decreasing trend from north to south in terms of well-being. Inhabitants of Northern Italy show average PGWBI values 4 point higher than Southern citizens—this difference being statistically significant. Also the difference between Northern and Central areas is still noticeable (a 1.3 points spread in favor of North). The size of the effect is smaller now, however, and not statistically significant. The health status is clearly more specific in determining substantial differences among well-being scores. We observe statistically significant differences already when comparing the no disease situation versus the presence of just one disease, and at each increase in the number of diseases, groups are statistically well separated with the exception of 1 vs. 2 diseases. Also cultural consumption levels are associated with statistically significant, different well-being scores. In fact people, with no consumption of cultural activities show average PGWBI values statistically lower than people with 1–25 activities/year, a category which in turn presents a statistically significant inferior level of well-being with respect to the 26–103 activities/year category. Beyond this level, a further increase in cultural consumption doesn't produce any further statistically significant increases in well-being.

From this univariate analysis it results quite clearly that health status and cultural consumption are the dominating factors that potentially affect well-being. This evidence is further corroborated by a more disaggregate comparative analysis.

Coming to a more detailed analysis of the effects of specific forms of cultural consumption, the univariate analysis shows that, for most cultural variables, the level of consumption is indeed highly correlated with psychological well-being (Table 3);

Table 3 Descriptive features for the sample population

Feature	No.	PGWBI		
		Average	S.D	I.C
Gender				
Female	779	74.82	18.23	73.53–76.1
Male	721	80.96	16.62	79.74–82.17
Age(years)				
15–17	48	85.1	12.97	81.33–88.86
18–20	93	78.81	15.86	75.55–82.08
21–24	79	78.49	15.44	75.03–81.94
25–29	62	79.72	12.79	76.47–82.97
30–34	150	79.49	18.33	76.54–82.45
35–39	102	79.73	15.64	76.66–82.8
40–44	142	77.65	17.32	74.77–80.52
45–49	128	77.69	17.18	74.68–80.69
50–54	138	76.81	18.23	73.75–79.88
55–64	318	76.5	18.76	74.43–78.57
65–74	167	76.82	17.74	74.11–79.53
75–100	73	72.73	24.02	67.13–78.34
Income				
<=1.000€	193	71.13	21.95	68.01–74.25
1.001–1.500€	299	77.7	17.17	75.74–79.65
1.501–2.500€	361	78.71	16.77	76.97–80.44
>2.500€	265	80.03	14.03	78.33–81.73
doesn't state	382	78.72	18.28	76.88–80.56
Job				
Entrepreneur	100	80.96	16.14	77.76–84.16
Manager	22	84.45	17.46	69.76–88.36
Teacher	74	77.99	16.56	74.15–81.83
Employee	261	78.32	15.65	74.15–81.83
Artisan	29	78.26	18.39	71.27–85.26
Blue collor	191	79.2	18.68	76.27–84.69
Farmer	9	69.67	27.44	26.01–113.33
Housekeeping Woman	192	74.8	18.78	72.13–77.48
Retired	362	77.32	19.28	75.33–79.32
Unemployed	61	70.27	21.12	64.86–75.68
Student	189	79.41	14.98	77.26–81.55
Unspecified	10	87.27	20.8	72.39–102.15
Civil status				
Single	429	79.48	16.18	77.94–81.01
Married	938	77.54	18.08	76.38–78.7
Widow	90	72.44	20.35	68.18–76.7
Divorced	43	76.83	17.12	71.56–82.1

Table 3 (continued)

Feature	No.	PGWBI		
		Average	S.D	I.C
Schooling and education				
University degree	195	78.35	15.66	76.01–80.69
High school	1240	78.92	15.29	76.2–81.64
Primary school	165	72.23	18.47	63.59–80.88
Disease				
No disease	489	83.17	15.23	81.82–84.52
1 disease	360	79.94	16.01	78.28–81.60
2 diseases	264	77.03	18.43	74.79–79.26
3–5 diseases	342	70.90	17.57	69.03–72.77
>5 diseases	45	58.18	22.45	51.43–64.92
Geography				
North	696	79.34	17.71	78.02–80.66
Centre	293	78.04	17.12	76.07–80.00
South	511	75.47	17.91	73.92–77.03
Culture				
No consumption at all	93	65.4	22.42	60.75–70.04
from 1 to 25 per year	448	74.2	17.72	72.55–75.85
from 26 to 100 per year	467	80.14	15.88	78.70–81.59
over 100 per year	380	81.61	16.18	79.97–83.24

this is true in particular for Jazz Concerts, Opera/Ballet, Sport Practice, and Classical Music. There are even activities for which high access entails a negative (though modest) impact on PGWB: Poetry Reading and Cinema d'essai. Table 4 reports the analysis undertaken on the whole sample, where access is set to zero in case of no consumption, and to 10 times/year or more in case of maximal consumption.

In order to better understand the influence of each item in relation to well-being, a sub-sample of 956 subjects from the whole sample was extracted, satisfying the following conditions:

A. subjects with a PGWB Index higher than 85 (n=488);
B. subjects with a PGWB Index lower than 70 (n=468);

The rationale behind this choice is simple: As linear correlation between independent variables and target variables was extremely low, and so was R^2, we tried to check whether, by singling out subjects with relatively high and low PGWB values, respectively, and thereby eliminating 'ordinary' subjects with average levels of well-being, more definite results emerged and a larger amount of variance was explained. This amounts to a 'high vs. low' dichotomization of the values of the dependent variable (PGWBI scores).

Table 5 shows the distribution of the linear correlation index between each of the 57 variables and the dependent variable, i.e., high PGWB scores (>85). All cultural

Table 4 Mean values of PGWBI corresponding to no or maximal consumption of different cultural activities

Activity	No consumption			Maximal consumption			Difference	p
	mean PGWBI	SD	No.	mean PWBI	SD	No.		
Cinema	76.06	19.01	716	79.07	14.15	124	3.96%	0.09
Theatre	76.55	18.56	928	78.36	13.72	27	2.36%	0.62
Opera/Ballet	77.34	17.9	1231	86.9	17.46	10	12.36%	0.09
Classical music	77.35	18.09	1237	84.86	11.87	7	9.71%	0.27
Pinting exibitions	75.88	19.06	841	78.83	16.31	22	3.89%	0.47
Museums	75.73	19.35	704	79.8	14.16	34	5.37%	0.23
Novels reading	75.52	19.57	510	80.34	16.45	167	6.38%	0.01*
Poetry reading	77.59	17.9	1143	75.59	22.58	13	−2.58%	0.69
Disco	77.25	18.4	1136	80.23	14.55	100	3.86%	0.12
Sport practice	73.41	19.04	562	81.2	16.11	649	10.61%	0.001*
Rock concerts	76.86	18.74	970	77.86	13.74	30	1.30%	0.77
Jazz concerts	77.56	18.08	1304	95.33	19.4	3	22.91%	0.09
Sport watching	76.5	18.76	918	82.97	14.93	89	8.46%	0.01*
Social activity	76.77	18.13	916	80.47	17	167	4.82%	0.01*
Local community development	76.52	18.4	1045	81.26	15.02	93	6.19%	0.02*
Cinema d'essai	77.81	17.91	1281	75.43	14.14	14	−3.06%	0.62

variables, apart from Jazz Concerts, are positively correlated to a high PGWB score (notice that, on the contrary, when the whole range of PGWBI scores was considered, access to Jazz Concerts entailed a considerable increase in the mean PGWBI score). As expected, all disease variables are negatively correlated to a PGWB high score. Also in this case, however, the results of the univariate linear correlation analysis provide little insight: Despite the fact that most correlations have the 'proper' sign, they are generally very low and do not allow to sketch a clear picture of the phenomenon. There seems to be no value added in attempting a more general, multivariate linear analysis. Thus, according to conventional wisdom, it seems that cultural access is not so relevant as a determinant of subjective well-being.

But before we wrap up such negative conclusions, there is a further step to be taken: Analyzing the same data by means of intrinsically non-linear techniques that are able to decipher the multi-dimensional relationships among variables by computing the whole function that links them to the target (PGWBI) variable. To do this, we have to introduce our ANN based approach.

ANN Analysis

The starting point of our ANN methodology is to apply the already mentioned TWIST system (see Appendix 1), to process the full data set in order to understand which are the variables that really matter in predicting the (PGWBI) target. The

Table 5 The linear correlation index between each independent variable and PGWBI

Variable	r value	Variable	r value
Cinema	0.06	Anxiety	−0.05
Theatre	0.03	Osteoarthritis	0.19
Opera_Ballet	0.04	Migraine	−0.04
Classical_Music	0.04	Gastritis	−0.07
Painting_Exhibition	0.05	Menopause	−0.03
Museums	0.07	Obesity	0.00
Novels_Reading	0.07	Kidney_Diseases	−0.02
Poetry_Reading	0.02	Liver_Diseases	0.03
Disco	0.04	Multiple_Sclerosis	−0.03
Sport_Practice	0.21	Thyroid_Diseases	−0.05
Rock_Concerts	0.04	Colitis	−0.02
Jazz_Concerts	−0.01	Osteoporosis	−0.02
Sport_Watching	0.07	Divorced	−0.05
Social_Activity	0.04	Age	−0.09
Hypertension	−0.13	Schooling	0.08
Miocardial_Infarction	−0.08	Urban_Area	0.02
Heart_Failure	−0.12	Rural_Area	0.01
Diabetes	−0.09	Semi_Urban	−0.03
Angina	−0.07	Low_Income	−0.15
Cancer	−0.06	Average_Income	0.00
Allergy	−0.09	High_Income	0.07
Arthritis	−0.25	Income_No_Information	0.06
Low_Back_Pain	−0.18	Male	0.18
Blindness	−0.13	Female	−0.18
Lung_Diseases	−0.08	Unemployed	−0.07
Skin_Diseases	−0.08	Retired	0.00
Depression	−0.15	Blue_Collar	−0.05
Anemia	−0.09	White_Collar	0.06
		Student	0.03

process led to the selection of 31 variables, that together allegedly provide a sufficient statistic for the problem under study. The list of such variables is reported in Table 6.

Is interesting to notice that 7 out of the 15 variables related to cultural access have been independently selected in the relevant informational base by the TWIST system.

Standard supervised artificial neural networks belonging to the Back Propagation family (Haykin 1998) have been then put at work on the subset of 31 variables selected by TWIST. We employed a cross-validation protocol, in which the sample is randomly divided into two sub-samples, implying a similar distribution of target variables: The training set (containing the dependent variable so that the system can

Table 6 Variables selected by the TWIST system

Cinema	Anemia
Theatre	Osteoarthritis
Classical Music	Migraine
Painting Exhibitions	Obesity
Novel Reading	Kidney Diseases
Poetry Reading	Colitis
Sport Practice	Divorced
Heart Failure	Urban Area
Diabetes	Rural Area
Arthritis	Semi Urban
Low Back Pain	Low Income
Blindness	Income No Information
Lung Diseases	Female
Skin Diseases	Unemployed
Depression	Retired
	Student

learn from error), and the testing set (where prediction is blind). During the training phase, the ANNs learn a statistical model for the observed data and then, on the basis of that model, they classify the items in the testing set without any feedback. The training and testing sets are then reversed (without memory). We have therefore two experiments, the first one called A-B (training on subset A and testing on subset B), and the second called B-A (training on subset B and testing on subset A).

During the training phase, it is possible to monitor the complex pattern of the neural network computation, which determines the relative importance of each variable in enabling the system to effectively predict the target variable. In other words, this analysis provides us with what we may call the 'input relevance' of each variable. Input relevance is expressed as a quantity of an arbitrary scale proportional to the importance of the contribution of that variable to the implicit statistical model. Once this analysis is carried out, it is interesting and quite surprising to ascertain that, according to average input relevance (as computed in both A-B and B-A tests), we find that 4 culturally related variables firmly sit within the top 11 scoring variables: That is to say, certain forms of cultural access prove to be quite important predictors of actual PGWBI levels. In Fig. 2, we report the ranking of input relevance in decreasing order. The four implied variables are Sport Practice, Novels Reading, Cinema, and Theatre. The most relevant one, Sport Practice, is not properly speaking a 'cultural' variable, but it is nevertheless interesting to notice how it works as a joint predictor of PGWB with other, properly cultural access experiences such as reading, cinema and theatre. Moreover, the two spheres are far from separate in the perspective of an eudaimonic view of human development (Riff and Singer 2008), and are often associated in analyses of well-being (Bell 2006). It is not incidental that there are activities, such as dance, for instance, that could be equally well fitting into both categories of cultural access and sport practice. Moreover, it has to be

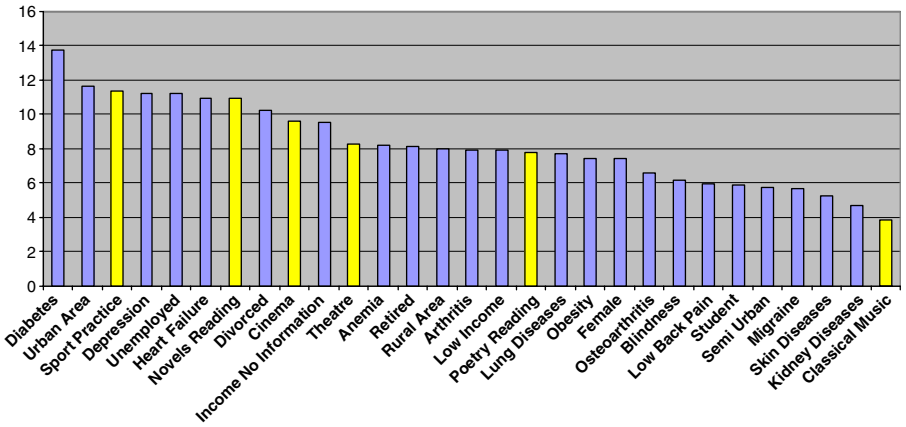

Fig. 2 Input relevance ranking

stressed that, unlike passive sport watching, sport practice shares with 'proper' cultural access the key characteristics of the development of personal capabilities and competences, i.e., a pro-active, learning oriented use of one's own time and energy. It is, thus, important to point out that sport and cultural access together may be read as a strong marker of an active and healthy life, and this is noteworthy not only from the point of view of the interpretation of the empirical analysis, but also in terms of the design of future health policies encouraging inclusive notions of capability-based fitness.

Discussion and Conclusions

The aim of this exploratory study was, primarily, to evaluate the role of cultural activities in the strict sense (i.e. cultural experiences that are object of intrinsically motivated cognitive investments by attendees) as a determinant for individual psychological well-being. Moreover, provided that cultural access was indeed relevant to some degree as a determinant of psychological well-being, we were interested in assessing the impact of each cultural activity within a given reference list employed in this study as compared to non-cultural variables. The present study is, to our knowledge, one of the first attempts to evaluate the well-being implications of cultural activities conducted on a relatively large sample at a national level, and in this respect it has the prerequisites to deliver a few empirically founded results, and thus provide a preliminary evaluation of the relevance of cultural access for public health theory and policy issues. In particular, we believe that acknowledging cultural access as a major determinant of subjective well-being can be conducive to novel, challenging approaches to the design and implementation of public health strategies.

The relationship between cultural access and subjective well-being, however, is likely to be quite subtle and elusive, at least when investigated by means of conventional univariate, bivariate or multivariate statistical analysis. Cultural habits are manifold, and are rarely reducible to single-channel patterns: People with cultural interests tend to allocate their time, attention and energy among several different

activities. Therefore, if one wants to trace how cultural access contributes to psychological well-being, there is a strong necessity to rely upon tools that allow the researcher to take into account this inextricable multi-dimensional association between variables that translate the typical behavioral patterns of (cultural) choice. To this purpose, we have to dismiss models where only a few variables are selected through linear correlations, for the result would be a model that is unable to consider in full the dynamic interaction of variables, in order to assess their joint predictive potential. The advanced ANN techniques adopted in this paper, however, allow us to do precisely this, and consequently to evaluate what is the best bundle of variables that explains the variability of the target, and the internal ranking of such variables in terms of relative predictive power. Once we put the culture/well-being link under the right set of analytical lenses, it turns out quite clearly that 'culture counts', namely, that there is clear evidence that cultural access has a definite impact on individual psychological well-being (and particularly so if cultural access occurs in a well-balanced mind-body perspective), and moreover that culture provides for some of the most effective predictors of well-being. The use of the PGWBI for this exploratory research has given us the opportunity to establish a possible comparison of the relative predictive potential of cultural and non-cultural factors. Moreover, the two previous survey waves conducted in 2000 and 2004 with the same tool, allowed researchers to highlight the role of culture on the basis of comparative evaluation on a robust database.

Our evidence thus shows that, at least for specific forms of cultural access, individual well-being is substantially affected, and therefore policies aimed at fostering cultural access can be regarded (and suitably reframed and re-designed) as health policies. The use of artificial neural networks, which allows to work with very complex predictive models, taking into account all sorts of interactions among variables (however complex), shows that the contribution of cultural access is not simply related to other well known determinants of subjective well-being, like levels of education, income, or age, as it is contended by conventional wisdom in the field. Specifically, on the basis of our data, in a hypothetical scale of major determinants of PGWBI, culture (meant in the eudaimonic, capability-based sense, and thus inclusive of sport practice) ranks third, right after (absence of) diseases and income, and turns out to be substantially more relevant of categories like age, education, gender, or employment, all of which have so far received considerably more attention than cultural access (and, more generally, capability building), in the relevant literature.

Rank	Variable	Weight% variable
1	Disease	38,46%
2	Income	17,95%
3	Culture	17,38%
4	Age	12,82%
5	Education	12,18%
6	Gender	8,33%
7	Employment	7,69%
8	Geography	6,41%

It is also appropriate to notice that the evidence deriving from an Italian sample might lead to *under*-estimate the well-being potential of cultures in mature socio-economic settings. Italy, in fact, ranks *below* the EU-27 average of cultural access as measured by the Eurobarometer (2007) survey, and consequently it is likely that samples from more culturally-oriented societies (and in particular, in a European context, Northern European ones), would deliver much sharper results in this respect. We have collected preliminary evidence on a comparison between a Northern Italian province characterized by high levels of cultural access (Bolzano/Bozen) and a Southern Italian province with low cultural access (Siracusa) by building specific accessory samples to the national one presented in this paper, that seems to confirm this intuition: The impact of culture on well-being in a context with high cultural access is definitely more substantial than in the context with low cultural access. We will present and discuss in detail these results in a forthcoming paper (Grossi et al. 2010).

How can we make sense of these still preliminary results? As a matter of fact, different sources of evidence suggest that culture and the arts affect many aspects of our lives. Participating in the arts and experiencing culture on a somewhat regular basis can have physical, mental and social effects. Our results add something new to the picture, in that the relevance of cultural participation for well-being calls for a new wave of policies addressing individual and social issues of human deprivation, thereby widening the scope of well-being focused policy strategies (Hagerty et al. 2001). For instance, urban transformation policies should focus upon arts and culture as an engine of individual and social change, that is likely to favor emotionally-based effects such as community engagement and empowerment, whose impact on subjective well-being may be substantial. Shaping the social architecture of communities through cultural sociability and participation may exert a deep influence on the perception of worthiness and meaning of one's own way to spend personal time and energy. The links between cultural access and human and social development are therefore much more substantial than one could expect at first sight, and are rooted in the very foundations of the rationality norms that govern non-instrumental behaviors. And this deep link does not lend itself to mechanistic recipes about cultural and creative development which are the daily bread of instrumentally rational approaches to these issues (Florida 2002). Our results tend to suggest that the quality of cultural participation alone may generate powerful developmental effects, irrespectively of the instrumental economic impact of cultural activity, and that the public health dimension is of foremost importance in this respect. Seen from our perspective, instrumental approaches to cultural development may cause lack of social sustainability and welfare losses in that they discourage individual, intrinsically motivated participation in favor of opportunistically motivated appropriation of its economic effects (Sacco and Tavano Blessi 2009).

But the strategic importance of culture in this particular context has to do not only with its capacity of shaping well-being by improving collective processes of sense-making and of fostering new forms of sociability, but also with its strategic complementarity with the social production of other intangible resources such as education and skills, which are fundamental to local development processes. A full account of these complex effects, as well as a less sketchy theoretical discussion of the developmental role of culture as mediated by psychological well-being, will be the object of future study.

To sum up, the points of strength of this study are the sample size, the methodological criteria used for sample stratification, the robustness of the well-being index employed and the power of the inference engine, based on artificial neural networks. Some limitations are related to the fact that this is a cross-sectional research, and not a longitudinal one, thus not allowing for evaluation of dynamic impacts. Moreover, our analysis is based on individual statements and memories of one's cultural habits, that cannot be checked, for example through a memory card recording the real participation to culture-related activities, something that would allow us a more objective assessment of the relationship between actual cultural access and psychological well-being. Analogous remarks can be carried out with reference to subjects self-reporting their (perceived) diseases. It is therefore necessary to develop more sophisticated observation tools and devices to capture the needed information, whereas minimizing as far as possible informational noise. This is a much needed improvement, and an exciting challenge for the research to come.

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Appendix 1: The TWIST Methodology

TWIST (Buscema 2005) is an ensemble of two distinct algorithms: T&T and I.S.

T&T

The "Training and Testing" algorithm (T&T) is based on a population of n ANNs, managed by an evolutionary system. In its simplest form, this algorithm reproduces several distribution models of the complete dataset DΓ (one for every ANN of the population) in two subsets ($d_{\Gamma}^{[tr]}$, the Training Set and $d_{\Gamma}^{[ts]}$, the Testing Set). During the learning process each ANN, according to its own data distribution model, is trained on the subsample $d_{\Gamma}^{[tr]}$ and blind-validated on the subsample $d_{\Gamma}^{[ts]}$.

The performance score reached by each ANN in the testing phase represents its "fitness" value (i.e., the individual probability of evolution). The genome of each "ANN-individual" thus codifies a data distribution model with an associated validation strategy. The n data distribution models are combined according to their fitness criteria using an evolutionary algorithm. The fitness-based selection of "ANN-individuals" determines the evolution of the population; that is, the progressive improvement of performance of each network until the optimal performance is reached, which is equivalent to the optimal splitting of the global dataset into subsets. The evolutionary algorithm ruling this process, named "Genetic Doping Algorithm" (GenD), is similar to a genetic algorithm (i.e. it works by crossover and mutation genetic operators), but maintains a constitutional instability

across the evolutionary process, thereby sustaining a natural proliferation of biodiversity and a continuous meta-evolution of the population.

The working of T&T is organized into two phases:

1) *Preliminary phase*: In this phase, an evaluation of the parameters of the fitness function that will be used upon the global dataset is performed. During this phase, an inductor $\Omega_{D_{\Gamma}^{[tr]},A,F,Z}(\cdot)$ is set up, which consists of an artificial neural network equipped with a standard Back Propagation algorithm. For this inductor, the optimal configuration is determined at the end of different training trials on the global dataset D_{Γ}. In this way, the configuration that most "suits" the available dataset is determined: The number of layers and hidden units, and some possible generalizations of the standard learning law. The parameters thus determined define the configuration and the initialization of all the ANN-individuals of the population, and will subsequently stay fixed in the following computational phase. Basically, during this preliminary phase there is a fine-tuning of the inductor that defines the fitness values of the population's individuals during evolution.

   The accuracy of the ANN performance upon the testing set will be the fitness of that individual (that is, of the trial-specific tentative distribution into two halves of the whole dataset).
2) *Computational phase*: The system extracts from the global dataset the best training and testing sets. During this phase, the ANN-individuals carry out their computational task, based upon the established configuration and the initialization parameters. From the evolution of the population, managed by the GenD algorithm, the best distribution of the global dataset DΓ into two subsets is generated, starting from the initial population of possible solutions $x = \left(D_{\Gamma}^{[tr]}, D_{\Gamma}^{[ts]}\right)$. Preliminary experimental sessions are performed using several different ANN initializations and configurations, in order to achieve the best partition of the global dataset.

I.S.

Parallel to T&T, TWIST runs I.S. (Input Selection), an adaptive system which is also based on the evolutionary algorithm GenD, and that is able to evaluate the relevance of the different variables of the dataset in a sophisticated way. Therefore, it can be considered as a tool at the same level as a feature selection technique.

From a formal point of view, I.S. is an artificial organism based on the GenD algorithm, and consists of a population of ANNs, in which each one carries out a selection of the independent variables on the available database. The elaboration of I. S., as for T&T, is developed in two phases:

1) *Preliminary phase*: An inductor $\Omega_{D_{\Gamma}^{[tr]},A,F,Z}(\cdot)$ is configured to evaluate the parameters of the fitness function. This inductor is a standard Back-Propagation ANN. The parameters configuration and the initialization of the ANNs are carried out with particular care to avoid possible over-fitting problems that can be present when the database is characterized by a large number of variables that describe a small quantity of data. The number of epochs E_0 necessary to train the inductor is determined through preliminary experimental tests.

2) *Computational phase*: The inductor carries out its computational task, with the configuration determined in the previous phase and the fixed initialization parameters, to extract the most relevant variables of the training and testing subsets. Each ANN-individual of the population is trained on the training set $D_{\Gamma}^{'[tr]}$ and tested on the testing set $D_{\Gamma}^{'[ts]}$.

The evolution of ANN-individuals in the population is again based on GenD. In the I.S. approach, the GenD genome consists of n binary values, where n is the cardinality of the original input space. Every gene indicates whether the corresponding input variable is active or not in that particular selection of variables. For each genome, the relevant fitness value is computed as usual. Through the evolutionary algorithm, the different "hypotheses" of variable selection, generated by each ANNs within the population, change over time, at each generation: This leads to the selection of the best combination of input variables. As in T&T, the crossover and mutation genetic operators are applied upon the ANNs population; the rates of occurrence for both operators are adaptively self-determined by the system at each generation.

When the evolutionary algorithm no longer improves its performance, the process stops, and the best selection of the input variables is employed on the testing subset. In order to improve the speed and the quality of the solutions that have to be optimized with respect to standard evolutionary algorithms, GenD does not breed the best-performing ANN-individuals, but rather the most representative ones. The selection criterion is therefore not that of picking up momentarily brilliant but possibly unreliable outliers, but rather reinforcing those characteristics that are stably well performing.

Appendix 2. List of Diseases Included in the Questionnaire

Hypertension
Heart Attack
Heart Diseases
Diabetes
Angina
Cancer
Allergy
Arthritis
Low Back Pain
Lung Diseases
Skin Diseases
Deafness
Limited Arms and/or Legs Functionality
Blindness
Psychiatric Disturbances
Depression

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