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The Role of Folk Dance in the Processes of Individual and Social Wellbeing: a Comparison with Other Popular Recreational Activities Through Models of Decision Theory and Game Theory

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Abstract

A qualitative and quantitative study, in which the individual benefits and social benefits of folk dance are compared with those obtained from the most popular recreational activities and regenerative properties, physical and mental, individual and social, is presented. Our starting point consists in the definition of the basic objectives of each individual for achieving the physical and mental wellbeing and a satisfactory placement in a pleasant and stimulating social environment. Moreover we compare some bodily activities, mental and otherwise designed to get these goals. Our present study is based on a qualitative analysis, quantitative models of decision theory, and a collection of opinions of experts and practitioners. In this framework we show that both subjective and objective benefits of folk dance practice are higher than those deriving from other activities taken in consideration, with respect to the same set of objectives. Furthermore, the folk dance has positive effects over the individual in the strict sense (improvement of physical and mental activities and personality) and in his relations with others. Our interpretative hypothesis of the achieved results is that the folk dance has some specific features that are present only in part in other activities, characteristics linked to the intimate nature of human beings that integrate and enhance each other.

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1. Introduction and motivation

The purpose of our research is to help individuals to choose activities that allow them to get more wellbeing. In particular, we propose a procedure for the evaluation of individual and social benefits of some of the most popular recreational and regenerative activities.

Our starting point consists in the definition of the basic objectives of each individual for achieving the physical and mental wellbeing and a satisfactory placement in a pleasant and stimulating social environment. Moreover we compare some bodily activities, mental and otherwise designed to get these goals.

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In particular let us mention the following:

- the language of folk dance is universal because it makes use of a basically non-verbal communication, and therefore unable to overcome cultural and social status barriers;
- folk dance may be practiced regardless of age, for the social purposes it requires no special technical skills or specific athletic training, overcoming many of the difficulties of integration between individuals due to differences in age and physical and mental condition;
- folk dance appears as a sporting and mental stress-free activity, that can be formalized mathematically as a cooperative game, in which the utility of cooperation is far greater than the sum of the utilities of physical or mental activities that can be carried out by individuals or small groups;
- the lack of competitive athletic purposes leads to activation of the processes of socialization and improves the individual's relationship with the outside world. Dancing together leads to the creation of a supportive community that recognizes itself in the ritual and celebrates its membership through the sharing of encoded repertoire of steps, movements, musical themes and conventions assembled in creative ways.

2. Some of the principal ricreative activities and their impact on individual and social wellbeing

In order to compare the various recreational activities we must enunciate with a hierarchical procedure that objectives individuals wish to achieve and which implicitly define the concept of wellbeing.

First we will examine some definitions found in the scientific literature and starting from them, we will take into account some parameters that seem more significant, in reference to the popular recreational activities.

a. Concept of wellbeing in the scientific literature

The World Health Organization (WHO) defines “wellbeing” as “the emotional, mental, physical, social and spiritual state that allows people to reach and maintain their potential in society”. The word "wellbeing" indicates not only the fact that an individual is free from disease but also that he is in good physical and mental health and he is able to meet his needs.

In (Maslow, 1954, 1968) the needs of an individual are classified in five hierarchical levels from the most basic to the most complex, i.e. from physiological needs to those of self-actualization. The levels of needs are: Physiological, Safety, Love/Belonging, Esteem and Self actualization (making their own identity and their own expectations and occupying a satisfactory position in social group).

The “Ottawa Charter for Health Promotion” (*International Conference on Health Promotion, 17-21 November 1986, Ottawa, Ontario, Canada*) states that health promotion should lead to living and working conditions are safe, stimulating, and satisfying. It must ensure the protection of natural and artificial environments, conservation of nature reserves. Finally, should allow a systematic evaluation of the effects of the environment on the wellbeing of the people and ensure that strategies and actions aimed to induce changes in the individual and in society.

Numerous studies share the results of wellbeing in an integrated vision of the body (Bartenieff, 1980) for which the satisfaction of most aspects of the individual leads to an overall wellbeing (Pert, 1997).

b. *An implicit definition of wellbeing by means of objectives and criteria*

In order to obtain a quantitative measure of the degree of wellbeing of the most common recreational activities that regenerate the physical fitness, promote mental activity and facilitate social inclusion, let us introduce an implicit definition of wellbeing elaborated using a hierarchical procedure.

We assume the wellbeing defined by the achievement of certain objectives in turn specified by appropriate criteria. The objectives are to achieve the *physical*, *mental* and *relational* wellbeing. For each of them a committee of experts has identified a weight representing the degree of importance of the objective for the overall wellbeing.

Were also identified 15 criteria that contribute to determine the achievement of each of the objectives considered. Finally, for each pair (objective O_i – criterion C_j) the committee of experts has assigned a weight which measures the degree to which the criterion C_j satisfies the objective O_i . The weights were assigned by following the procedure of pairwise comparison and verification of consistency introduced in (Saaty, 1980).

This “axiomatic” interpretation of the concept of wellbeing has certainly limits and can be improved. However allows us to assign a score to overall wellbeing that an average individual can achieve in each of the most common recreational activities.

It is also possible to judge as can vary the degree of overall wellbeing as a function of the variation of the degree of fulfilment of the criteria considered. In particular, one can identify the critical points, namely the (objective – criterion) combinations that have the greatest influence on global wellbeing of the individual.

c. *Some ricreative activities and their benefits in individual and social wellbeing*

The most common recreational activities can be classified into:

- (a) activities in which is prevalent the *physical* effort, such as *tennis*, *soccer* and *dancing*;
- (b) activities in which the goal is especially mental like *chess*, *playing cards* and *reading books*;
- (c) activities which are predominantly *social*, such as *folk dancing*, *choral singing*;
- (d) activities minimizing the physical or mental effort, and where there is not a social interaction. In particular we refer to the reading of texts are not binding (e.g. *newspapers* and *magazines*), watching shows (*cinema*, *television*, etc.) and as an extreme situation we can refer to a lifestyle “passive” in which the individual does not practice any recreational activities.

The activities of type (a) are based on the idea that in order to achieve a good quality of life (wellness) is essential to practicing a regular physical activity, without stressful or traumatic aspects. Physical commitment promotes coordination, develops muscle tone and flexibility, improves coordination and has benefits on cardiovascular system.

The activities of type (b) have more positive effects on the ability of concentration, self-control, discussion and analysis. There is not a physical effort or a social commitment.

The activities of type (c) prefer the social relationship. The sense of belonging, reassurance and cooperation contribute to the reduction of social isolation, to the understanding and reduction of the judgment, to the increasing tolerance and developing empathy. Physical contact reinforces the intimacy and the emotional brain's activation. The musical rhythm structures the meeting and lowers the level of competition. In folk dance, the anthropological aspect related to shared space and ritual reinforces social affiliation.

The activities of type (d) tend to rest the body and mind with a regenerative purpose.

3. Analytic Hierarchy Process for choice among alternatives

a. *The Analytic Hierarchy Process*

In order to compare the degree of wellbeing derived from the most common recreational activities, we use the Analytic Hierarchy Process (AHP) introduced by (Saaty, 1980) and applied to decision-making in many papers (see e.g. Maturò, Ventre, 2009a, 2009b).

Let us recall (Knuth, 1973) that a *directed graph* or *digraph* is a pair $G = (V, A)$, where V is the set of *vertices*, and A is a subset of $V \times V$, called the set of *arcs*. The vertices will be indicated with Latin letters. A pair (u, v) of vertices belonging to A denotes an arc with initial vertex u and final vertex v ; an n -tuple of vertices (v_1, v_2, \dots, v_n) denotes a *path* of length $n-1$, formed by the arcs (v_i, v_{i+1}) , $i = 1, 2, \dots, n-1$.

The AHP is based on the representation of a decision problem with a directed graph $G = (V, A)$, called *AHP-graph*, with the following five properties:

1. vertices are distributed in a given number $n > 2$ of levels, numbered from 1 to n ;
2. there is only one vertex with level 1, called the *root*;
3. for every vertex v different from the root there is a path passing through v and having the root as initial vertex;
4. each vertex of level $i < n$ is the initial vertex of at least one arc and there are no outgoing arcs from vertices of level n ;
5. if an arc has the initial vertex of the level i then his final vertex has level $i+1$.

In this paper we assume $n > 3$. Referring to our decision problem, the vertex of level 1 is the *overall goal*, the vertices of level 2 are the *specific objectives*, in simpler notation, the *objectives*, the vertices of level 3 are the *sub-objectives*, the vertices of level $n-1$ are the *criteria*, and finally the vertices of level n are the *alternatives* or *strategies* of the decision problem.

A decision maker or a committee assigns a score to each arc following the AHP procedure proposed in (Saaty, 1980, 2008). The score given to an arc (u, v) indicates the extent to which the vertex v satisfies the objective (resp. sub-objective, criterion, etc.) denoted by u . Scores are non-negative real numbers and the sum of the scores of the outgoing arcs from one vertex must be equal to 1. For every vertex v different from the overall goal, the score of v is the sum of the scores of all the paths that connect the overall goal with v .

Let x_1, x_2, \dots, x_p be the final vertices of the arcs leading out from a vertex v . If a decision maker, D , considers x_r to be preferred to (or is indifferent to) x_s , then he/she is requested to estimate the importance of x_r with respect to x_s , using one of the following linguistic judgments: *indifference*, *weak preference*, *preference*, *strong preference*, *absolute preference*. The linguistic values are expressed as numerical values following the Saaty fundamental scale: *indifference* = 1, *weak preference* = 3, *preference* = 5, *strong preference* = 7, *absolute preference* = 9. The scores 2, 4, 6, 8 are used for intermediate valuations.

If the object x_r has one of the above numbers assigned to it when compared with object x_s , then x_s has the reciprocal value when compared with x_r . A pairwise comparisons matrix $A = (a_{rs})$ with p rows and p columns is associated to the p -tuple (x_1, x_2, \dots, x_p) , where a_{rs} is the number assigned to x_r when compared with x_s .

Then one calculates the principal eigenvalue λ_1 of the matrix A and, among the eigenvectors associated with λ_1 , selects the one with all components w_1, w_2, \dots, w_p non-negative and sum $w_1 + w_2 + \dots + w_p$ equal to 1. The real number w_r is the score given to the arc (v, x_r) by the AHP.

The evaluations of the decision maker D may be inconsistent, because there may be problems in the allocation of the values of matrix A in terms of the transitivity of preference relations between the elements of the set $\{x_1, x_2, \dots, x_p\}$. Saaty suggests checking the consistency by calculating the number $\mu = (\lambda_1 - p)/(p-1)$. If this number $\mu \leq 0.1$ then consistency is considered acceptable, otherwise the decision maker is asked to revise the judgments.

b. The AHP model associated with the wellbeing problem

Referring to the considerations in Sec. 2., the AHP model associated with our problem consists of $n = 4$ levels. Specifically, at level 1 we have the general objective (OG): *achievement of wellbeing*. At level 2 we have three specific objectives: $O_1 = \text{physical wellbeing}$, $O_2 = \text{mental wellbeing}$, $O_3 = \text{relational wellbeing}$.

At level 3 we have identified the following criteria: $C_1 = \text{muscular tonicity}$, $C_2 = \text{body elasticity}$, $C_3 = \text{cardio-circulatory functions}$, $C_4 = \text{speed of thought and mental acuity}$ (and hence in *making decisions*), $C_5 = \text{body awareness}$ (image or drawing of your body), $C_6 = \text{empathy}$, $C_7 = \text{positive thinking}$, $C_8 = \text{mood tone}$, $C_9 = \text{nonverbal communication}$, $C_{10} = \text{physical contact}$, $C_{11} = \text{rhythm and instinctive brain activation}$, $C_{12} = \text{cooperation}$, $C_{13} =$

competition as a measure of physical and mental state, C_{14} = socialization, C_{15} = mental plasticity and improvement of experiences.

The alternatives considered are: A_1 = tennis, A_2 = soccer, A_3 = chess, A_4 = dance in pairs, A_5 = folk dance, A_6 = group dance, A_7 = reading, A_8 = vision of cinema, television and entertainment, A_9 = sing or play an instrument, A_{10} = card games, A_{11} = the individual does not practice any recreational activities.

c. Weights of criteria and scores of alternatives

An Interdisciplinary Committee of Experts (ICE) formed by a psychologist, a doctor, a mathematician and a sociologist, has expressed the opinions concerning the pairwise comparisons between objectives and those of pairwise comparisons between criteria with respect to each objective. Using the Saaty method we obtained from these evaluations, in order, the following numerical matrices:

- (1) the matrix of pairwise comparison between the objectives and the row vector V of the weights of the objectives;
- (2) the 3 matrices of pairwise comparison among criteria with respect to each objective and the matrix K with 3 rows and 15 columns where row i is the vector K_i of weights of the criteria with respect to the objective O_i ;
- (3) the row vector W of the weights of the criteria with respect to general objective (OG) calculated as the product matrix $W = V K$.

We obtained the following numerical results:

$$V = [0.701, 0.097, 0.202],$$

$$K_1 = [0.218, 0.190, 0.264, 0.036, 0.040, 0.000, 0.036, 0.037, 0.032, 0.063, 0.084, 0.000, 0.000, 0.000, 0.000],$$

$$K_2 = [0.000, 0.000, 0.000, 0.261, 0.133, 0.000, 0.095, 0.148, 0.135, 0.000, 0.075, 0.033, 0.018, 0.030, 0.071],$$

$$K_3 = [0.000, 0.000, 0.000, 0.029, 0.000, 0.156, 0.155, 0.136, 0.095, 0.086, 0.099, 0.086, 0.021, 0.065, 0.071],$$

$$W = [0.153, 0.133, 0.185, 0.056, 0.041, 0.031, 0.066, 0.068, 0.055, 0.062, 0.086, 0.021, 0.006, 0.016, 0.021].$$

In particular, greater weight is distributed on the criteria C_1 = muscular tonicity, C_2 = body elasticity, C_3 = cardio-circulatory functions, while a lighter weight is attributed to the criteria C_{13} = competition as a measure of physical and mental state, C_{14} = socialization, C_{15} = mental plasticity and improvement of experiences.

Subsequently, the Committee of Experts has expressed opinions on the pairwise comparison between alternatives with respect to each criterion and were built 15 matrices of pairwise comparisons M_j , $j=1,2, \dots, 15$.

Starting from the matrices M_j and using the procedure AHP a matrix S with 15 rows and 11 columns was obtained in which the row i -th is the vector S_i of the scores of alternatives with respect to the criterion C_i .

The matrix product $G = W S$ is a row vector of dimension 11, where the i -th component is the global score of the alternative A_i with respect to general objective (OG). We obtained the following numerical results:

$$S_1 = [0.171, 0.310, 0.020, 0.110, 0.170, 0.102, 0.019, 0.017, 0.045, 0.021, 0.015],$$

$$S_2 = [0.129, 0.143, 0.018, 0.244, 0.230, 0.127, 0.018, 0.018, 0.036, 0.019, 0.017],$$

$$S_3 = [0.262, 0.262, 0.014, 0.159, 0.112, 0.095, 0.014, 0.014, 0.038, 0.015, 0.015],$$

$$S_4 = [0.230, 0.224, 0.137, 0.107, 0.107, 0.075, 0.019, 0.020, 0.025, 0.040, 0.017],$$

$$S_5 = [0.174, 0.174, 0.018, 0.174, 0.174, 0.174, 0.017, 0.018, 0.038, 0.018, 0.018],$$

$$S_6 = [0.042, 0.078, 0.029, 0.296, 0.221, 0.113, 0.067, 0.037, 0.061, 0.037, 0.019],$$

$$S_7 = [0.127, 0.127, 0.028, 0.161, 0.208, 0.128, 0.049, 0.047, 0.070, 0.035, 0.020],$$

$$S_8 = [0.092, 0.190, 0.025, 0.110, 0.353, 0.074, 0.031, 0.043, 0.048, 0.023, 0.012],$$

$$S_9 = [0.048, 0.119, 0.027, 0.220, 0.322, 0.082, 0.032, 0.035, 0.034, 0.050, 0.032],$$

$$S_{10} = [0.030, 0.052, 0.029, 0.234, 0.399, 0.075, 0.033, 0.037, 0.038, 0.037, 0.036],$$

$$S_{11} = [0.154, 0.192, 0.034, 0.164, 0.225, 0.075, 0.038, 0.034, 0.046, 0.024, 0.015],$$

$$S_{12} = [0.066, 0.081, 0.014, 0.070, 0.096, 0.032, 0.016, 0.014, 0.020, 0.010, 0.006],$$

$$S_{13} = [0.025, 0.028, 0.010, 0.073, 0.166, 0.036, 0.020, 0.023, 0.039, 0.011, 0.005],$$

$$S_{14} = [0.028, 0.030, 0.011, 0.081, 0.184, 0.040, 0.022, 0.025, 0.044, 0.012, 0.006],$$

$$S_{15} = [0.058, 0.072, 0.013, 0.061, 0.084, 0.028, 0.014, 0.013, 0.017, 0.009, 0.006]$$

$$G = W S = [0.151, 0.191, 0.030, 0.167, 0.207, 0.098, 0.027, 0.027, 0.044, 0.027, 0.020].$$

The above results show the highest overall score for the *popular dance*, followed by *soccer*, *tennis* and *dance in pairs*, while the lowest score was obtained by more sedentary and less socializing activities as *not practice any recreational activities*, *reading*, *vision of cinema*, *television and entertainment*, *card games*.

The results are consistent with the most relevant scientific literature (Argyle, 1975; von Bertalanffy, 1951, 1969). The high score obtained by the folk dance can be explained by a few important functions that the group performs in this activity that develops a sense of belonging, shared rituals and reassurance (Bateson, 1979). The experience of physical contact, the musical rhythm and use relational space allow the individual an effective nonverbal communication and feel himself as part of a complex entity (a super-organism) having higher functions of the sum of those of the individuals. (Le Doux, 1996; Siegel, 1999; Watzlawick, Beavin, Jackson, 1967).

4. Conclusions and further research developments

A different point of view to evaluate the scores of leisure activities is obtained by reasoning in terms of cooperative games (Luce, Raiffa, 1957). Score of every alternative considered in Sec 3 may be seen as the minimum utility of a cooperative game, namely the utility that a single player is able to obtain independently of the strategies chosen by other players. The cooperation is defined in terms of establishing rules and group behaviour that increase the physical, mental and social wellbeing.

Interpreting the 11 recreational activities considered in the previous sections as cooperative games designed to achieve wellbeing is then necessary to identify the characteristic function for each of these games, indicating the utility of admissible coalitions. Moreover it is necessary to identify the criteria for allocating the benefits to the players of a coalition. For example, in folk dance, a coalition of two or more individuals can help raise the degree to which the popular dance meets the various criteria considered in the paper. An exchange of information or courtesies, a tolerant and friendly behavior in a coalition leads to an increase in the level of wellbeing of all members of the group.

In order to verify the validity of the results obtained from the evaluation of the Interdisciplinary Committee of Experts, some experiments are in progress in Social Centers and Schools in Italian province of Pescara, Italy.

The experiments are of two types:

(1) to fill out a questionnaire to a sample sufficiently large on the pairwise comparison between the alternatives with respect to the criteria;

(2) to investigate to what extent in the various recreational activities the formation of coalitions can increase the overall wellbeing of individuals.

In reference to point (1) the first results seem to be substantially in agreement with those presented in Sec. 3.

As regards point (2) a key step seems to be the consensus in the group (Maturò, Ventre, 2009b) and the activation of an external figure, let us call “the demiurge”, that neutrally present the advantage of making changes of behaviors for the wellbeing of all the individuals.

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