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On measuring tele

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Abstract The authors developed a method for measuring the *telic sensitivity* of individual members in a group, derived from the sociometric test, which has to be previously performed. Such a measure is subdivided into 4 indices: *composite indices of Positive* and *Negative Perception*, and *composite indices of Positive* and *Negative Mutuality*. Each index scores from 0 to 100. The indices have a normal distribution and, whenever the choices are randomized, an expected mean of 50 ($SD = 11.3$), irrespective of the size of the groups and the number of the received preferences and rejections. Young girls and boys (mean age 12 years) in actual school groups tend to have higher scores, especially for *Positive Perception* and *Positive Mutuality*, as opposed to randomized virtual groups. The authors identify other results in order to exemplify future research in clinical and organizational psychology settings

Keywords Sociometry · Sociodrama · Psychodrama · Tele · Mental health · Psychopathology · Human relationships

Die Messung von Tele

Zusammenfassung Die AutorInnen entwickelten eine Messmethode für das Tele von einzelnen Mitgliedern einer Gruppe, das sich in einem soziometrischen Test

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zeigt. Eine solche Messung ist unterteilt in vier Indikatoren: Verbundene Indikatoren für positive und negative Wahrnehmung und verbundene Indikatoren für die positive und negative Gegenseitigkeit. Jeder Index hat Werte von 0 bis 100. Die Indikatoren sind normalverteilt und wenn die Wahlen zufallsbestimmt sind, haben sie einen erwarteten Mittelwert von 50 (SD = 11.3), das ist unabhängig von der Gruppengröße und der Anzahl an erhaltenen Wahlen und Ablehnungen. Junge Mädchen und Buben (Durchschnittsalter 12) in Schulgruppen haben höhere Werte besonders in positiver Wahrnehmung und positiver Gegenseitigkeit im Gegensatz zu zufällig zusammengestellten virtuellen Gruppen. Die AutorInnen identifizieren noch andere Ergebnisse um künftige Forschung in klinischer und Organisationpsychologie anzuregen.

Schlüsselwörter Soziometrie · Sociodrama · Psychodrama · Tele · Psychische Gesundheit · Psychopathologie · Menschliche Beziehungen

1 Introduction

Moreno's psychodrama and sociometry changed the scope of psychology, psychopathology and psychotherapy, shifting it from the individual to relationships. The concept of tele underpinned this change. However, the definition of tele is somewhat ambiguous. It varies from being a measure of relationships, either generic—"Tele is what sociometric test measures" (Moreno 1954, p. 219)—or specific—"Tele was defined as the elementary liaison between individuals and between individuals and objects" (Moreno 1959, p. 52), —to a personal performance—"We will use the term tele to express the simplest unit of feeling transmitted from one individual towards another" (Moreno 1954, p. 211)—or ability—"Tele is the set of perceptive processes which enable the individual to evaluate correctly the environmental world" (Rojas-Bermudez 1966, p. 60). On the other hand, the concept of tele refers not only to attraction between people, but also to repulsion between them (Kellerman 1992, p. 102; Blatner 1994), and includes what may be called "negative tele" (Moreno 1954, p. 215). It "is an extension of the innate tendencies of organisms to show selectivity" (Blatner 1994).

For Moreno, the concept of tele could be compared to Freudian transference (Moreno 1946, pp. 284–289). However, transference depend on the subject's previous relationships and was usually pathological. On the contrary, tele depend on the present reality and should correct pathological transference. Thus, tele is not an explanation of relationships, but the actual relationship in each context and at each moment in time. It is objective and can be measured by means of the sociogram. Ideally, it must be appropriate and not contaminated by transference. Such appropriateness is difficult to evaluate, but it always implies some reciprocity.

To deal with appropriateness, Moreno introduced the sociometric perception test (Moreno 1954, p. 217), which has been incorporated into routine sociometric testing (Bastin 1966). Moreno expected that this new test would explain discrepancies between transmitted and received choices. In fact, in spite of often being chosen themselves, some subjects chose the few people who did not choose them. In other words, their choices were not mutual. As a consequence, they felt abandoned and

isolated: Tele did not happen. Moreno's hypothesis was that they did not perceive the effects of their choices on other people, nor were they aware of other people's choices. In Moreno's words, they had a "weak cognitive tele", which could be re-educated by means of psychodramatic techniques (Moreno 1954, pp. 216–218).

"Telic sensitivity" is crucial for psychotherapists (Blatner 1994) and, if we could assess it, such a measure would give us specific information about individual psychopathology and its evolution. In fact, as tele is sometimes distorted by transference or psychopathological states (social phobia, depression, mania, paranoia, schizophrenia), we find people who are aware of people who:

1) choose them but not of people who reject them;
2) reject them but not of people who choose them.

Moreover, some ambivalent people may think that they are

3) rejected by people who actually prefer them, and/or
4) chosen by people who actually reject them.

Finally, and regardless of their perceptions, people can even display mutual choices or rejections, or reject some people who choose them and choose people who reject them.

Although all this information seems complex, it is useful and it is contained in the sociometric test, providing this test includes questions about perception. The sociometric test, whose underlying concept is simple, gives information both about the informal structure of a human group and about each member in it, namely the distinction between *popular* (also called *stars*), *average, rejected* and *neglected* subjects (Bastin 1966; Newcomb et al. 1993). The sociometric matrix has been statistically studied (Moreno 1954) and it has undergone several developments, both graphical and numerical, which embrace reciprocities of choices and accuracy of perceptions (Bastin 1966; Bustos 1979; Moreno 1959). Generally, they are applied to the group for measuring social cohesiveness or, to specific individuals for measuring their psychological distance from the group or from another specific individual. Bustos (1979) proposed a "direct relationship index" and a "perception index". They describe the percentage of choices or perceptions which match the real choices of the receptors, including positive, negative and neutral choices. These indices may be comparable, but they can be distorted as long as neutral choices increase in large groups.

We could also count the number of correct perceived preferences or rejections as an index of accurate perception, in the same way that Moreno considered the importance of mutual choices in his sociogram. However, the probability of matching choices depends on the number of choices received. This index may therefore be biased by the status of the studied subject. On the one hand, a popular subject (preferred by most of the other members of the group), may display several perceptions which match the actual choices by pure chance. On the other hand, an isolated subject chosen by few other members may have the correct perception of all (the few) choices and have a smaller number of correct perceptions. Thus, there is not yet any way of studying individual telic sensitivity in a comparable and unbiased way (dependent neither on the sociometric status of the subject studied nor on the number of members in the group).

Composite index of Positive Perception: (cPP)

cPP=100: people who think they are only preferred by all people who actually prefer them.

cPP=0: people who think they are only preferred by all people who actually reject them.

Composite index of Negative Perception: (cNP)

cNP=100: people who think they are only rejected by all people who actually reject them.

cNP=0: people who think they are only rejected by all people who actually prefer them.

Composite index of Positive Mutuality: (cPM)

cPM=100: people who only prefer all people who actually prefer them.

cPM=0: people who only prefer all people who actually reject them.

Composite index of Negative Mutuality: (cNM)

cNM=100: people who only reject all people who actually reject them

cNM=0: people who only reject all people who actually prefer them.

Fig. 1 Extreme values and their putative meaning in the indices to develop

The goal of the present paper is to develop a method for measuring accurate perceptions and reciprocity of choices, both positive and negative, which permits individual comparisons irrespective of the number of members in a group and the number of received choices. We propose to derive four indices from the obtained sociometric data: (1) *index of Positive Perception (PP)*, to measure the accuracy of perception of preferences received by the subject; (2) *index of Negative Perception (NP)*, to measure the accuracy of perception of rejections; (3) *index of Positive Mutuality (PM)*, to measure transmitted preferences which match received preferences; (4) *index of Negative Mutuality (NM)*, to measure transmitted rejections which match received rejections. In order to include situations of misunderstanding (for instance, a subject who thinks he is chosen by people who actually reject him), we will try to develop composite indices.

The meaning of the extreme values of these indices is proposed in the Fig. 1. If these indices are displayed on a similar scale, we can compare the accuracy of perception for preferences versus rejections, and the mutuality of actual preferences or rejections. The indices for individuals belonging to the same or different groups, and the evolution of the indices in a subject belonging to several groups, can also be compared.

2 Mathematical development of the indices

In this section, we will develop the mathematical equations that allow us to have comparable indices not influenced by the size of the group and the status of each individual within the group. In order to have the raw data, we first need to perform a sociometric test and a sociometric matrix. An example of a sociometric matrix, after performing a sociometric test in a psychodrama group, will be displayed to illustrate the mathematical computation of each index.

2.1 Sociometric test

The sociometric test (Bastin 1966) consists of four simple questions asked to each member of a closed group. A specific task (the so-called sociometric criterion[1]) is

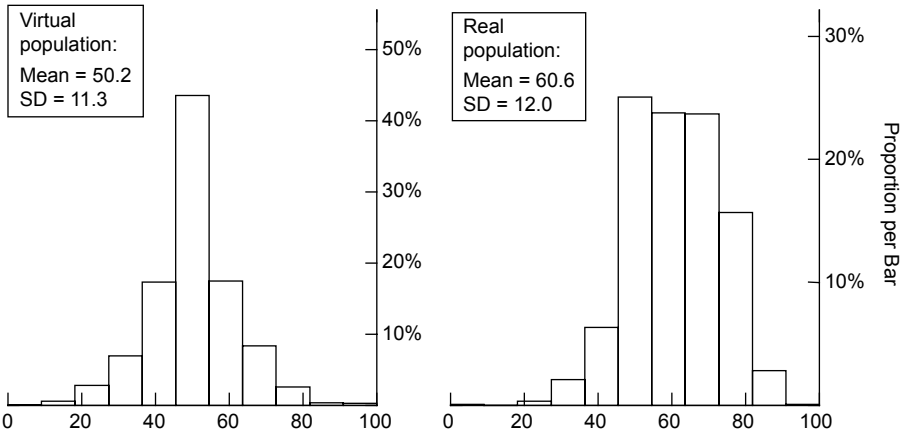

Fig. 2 Histograms of the composite indices in virtual population with randomized choices and real population

described, and then each member is asked about: (1) who will s/he choose to do this task with; (2) who will he reject; (3) who he thinks has chosen him; and (4) who he thinks has rejected him. There are several proposals to be found on the Internet for making a sociomatrix and a sociogram after performing a sociometric test[2]. These proposals frequently discard the perception questions (Q3 and Q4) and force choices and/or put limits on their number. In our current practice, the perception choices are optional although their absence makes the perception indices impossible) and we do not limit the number of choices or force them. However, the answers are sorted in order of preference.

Data are displayed in a squared matrix (see Fig. 2), where transmitters are displayed on the vertical axis (in columns) and the receivers on the horizontal axis (in rows). Since the choices are hierarchical, we labelled the first choice with the number five, the second with the number four, the third with the number three, the fourth with the number two, and the remaining with the number one. Preferences are labelled with positive numbers, and rejections with negative numbers. These values are important to develop the sociogram and to analyse leadership. In the context of the present work, we discard these values and only count the presence of a positive or negative number.

On the rows we can count the number of transmitted preferences (*tp*) and transmitted rejections (*tr*) for each subject. On the columns, received preferences (*rp*) and rejections (*rr*) can be counted. There are manual and computerized methods for finding reciprocal (mutual) preferences (*mp*) or rejections (*mr*). We also count the preferences which match rejections (inverse mutual preferences—*imp*), and the rejections which match preferences (inverse mutual rejections—*imr*). Perceived preferences or rejections can be displayed on the same matrix, as **p** or **r**, but in inverse order (from the horizontal to the vertical axis, or in columns instead of rows). It is thus easy to count the matched (correct) perceptions vertically, for both preferences (*cp*) and rejections (*cr*). In the same way, the number of transmitted perceptions, both of preferences (*pp*) and rejections (*pr*) can also be counted vertically.

Table 1 Sociometric matrix of a small psychodrama group

	A Anne	B Bob	C Clair	D Don	E Edna	F Fred	G Gary	Transmitted preferences *tp* (mutual/inverse)	Transmitted rejections *tr* (mutual/inverse)
A (Anne)	**0**	**−5**	**3 r**	**5**	**0**	**0 p**	**4**	3 (*mp*=2/*imp*=0)	1 (mr=0/*imr*=1)
B (Bob)	**2 p**	**0**	**5**	**3 p**	**0 p**	**0**	**4 p**	4 (*mp*=3/*imp*=1)	0 (*mr*=0/*imr*=0)
C (Claire)	**0 p**	**4 p**	**0**	**5 p**	**0**	**−5 r**	**3 r**	3 (*mp*=1/*imp*=1)	1 (*mr*=0/*imr*=1)
D (Don)	**5 p**	**3 p**	**0 p**	**0**	**−4 r**	**−5 r**	**4 p**	3 (*mp*=3/*imp*=0)	2 (*mr*=0/*imr*=2)
E (Edna)	**1**	**4 r**	**5**	**1 r**	**0**	**2**	**3 r**	6 (*mp*=1/*imp*=2)	0 (*mr*=0/*imr*=0)
F (Fred)	**1 r**	**4**	**3 r**	**1 r**	**2**	**0**	**5 p**	6 (*mp*=2/*imp*=2)	0 (*mr*=0/*imr*=0)
G (Gary)	**3 p**	**2**	**−5 r**	**4 p**	**−4 p**	**5 p**	**0**	4 (*mp*=4/*imp*=0)	2 (*mr*=0/*imr*=2)
Received Preferences (*rp*)	5	5	4	6	1	2	6		
Received Rejections (*rr*)	0	1	1	0	2	2	0		
Perceived Preferences (*pp*)	4	2	1	3	2	2	3		
Correct (*cp*)	3	2	0	3	0	1	3		
Inverse (*ipp*)	0	0	0	0	1	0	0		
Perceived Rejections (*pr*)	1	1	3	2	1	2	2		
Correct (cr)	0	0	1	0	1	2	0		
Inverse (*ipr*)	1	1	2	2	0	0	2		

Table 1 shows a matrix resulting from a sociometric test applied to a psychodrama group, where every member was asked to choose playmates to play a competitive game. As an example, subject C (Claire) has chosen Don, Bob (who has chosen her), and Gary (who has rejected her) to belong to her team, and has rejected Fred (who has chosen her). It can be seen that her preferences and rejections are not strongly mutual. For her part, Claire was chosen by four subjects (Anne, Bob, Edna, Fred), two of whom she has perceived as rejecting her, and was rejected by Gary, a rejection which matched her own perception. Since Claire is a special case of misunderstanding relationships, we will take her as an example in future calculations. Her figures are: *n* (number of members in the group)=7; *tp*=3; *tr*=1; *rp*=4; *rr*=1; *mp*=1; *mr*=0; *pp*=1; *pr*=3; *cp*=0; *cr*=1. We also have to take into account the figures for misunderstanding: *inverse perceived preferences* (perceived preferences which match actual rejections—*ipp*)=0; *inverse perceived rejections* (perceived rejections which match actual preferences—*ipr*)=2; *inverse mutual preferences* (transmitted preferences which match received rejections—*imp*)=1; *inverse mutual rejections* (transmitted rejections which match received preferences—*imr*)=1.

These data are computed to create the sociogram, for which we only use the first few choices of each individual list. Furthermore, it has been suggested that each member of the group may have a distinct sociometric profile based on the number of preferences and rejections, actual or perceived, transmitted or received (Bastin 1966; Newcomb et al. 1993). We can also compute the extreme figures exceeding a given

probability of occurrence (generally $p<0.5$). The classification of sociometric status is based on these extreme figures.

2.2 Measuring positive perception

We begin by measuring what we may call the *index of Positive Perception*. It was defined as a normalized and comparable index for detecting each member's ability to correctly perceive the preferences actually received from other members.

The starting numbers for measuring *Positive Perception* are:

pp—The number of displayed perceived preferences;

rp—The number of received preferences;

cp—The number of correct perceptions, the perceived preferences which match the received preferences.

This last number is the key one. However, we want to know the difference between this figure and the number of correct perceptions occurring by pure chance. Taking *n* as the number of members in the group, and the fact that a given member does not choose himself or herself, the probability of matching the received preferences, for each transmitted perception, is:

$$p = \frac{rp}{n-1}\left(p = \text{probability of matching for each transmission}\right). \tag{1}$$

However, since there is not just one, but *pp* transmitted perceptions of preferences, the expected mean matching for all the transmitted perceptions is:

$$X = \frac{pp \,.\, rp}{n-1}\left(X = \text{expected mean matching}\right). \tag{2}$$

Thus, the difference between actual *(cp)* and expected *(X)* correct perceptions is:

$$g_{am} = cp - \frac{pp \,.\, rp}{n-1}\left(g_{am} = \text{gain in the actual matching}\right). \tag{3}$$

For instance, in a group of $n=7$ members, C (Claire) receives $rp=4$ preferences, transmits $pp=1$ perceptions of preferences, and matches $cp=0$. We can thus compute:

$$g_{am\,(C)} = 0 - 1 * 4 / \left(7 - 1\right) = -0.666667$$

which is the gain in correct perception above the figure expected by chance (in this case, a negative gain).

However this number is only an indication, which must be compared with the chance a subject has of having the best matching. That is to say, if this member correctly perceived every received preference, he would have displayed four perceptions and matched all the received preferences. In this case, the best gain he could have would be:

$$g_{bm\,(C)} = 4 - 4 * 4 / (7 - 1) = 1.333333$$

or, in a generic formula:

$$g_{bm} = rp - \frac{rp.rp}{n-1} \left(g_{bm} = \text{gain in the best matching}\right) \tag{4}$$

Dividing *(3)* by *(4)*, we can finally arrive at a comparable *index of Positive Perception* (*PP*). In the above example, it would be $PP_{(C)} = -0.666667/1.333333 = -0.5$. Irrespective of starting data, this number will range between −1 and +1. The negative or positive signal depends on the correct perceptions being lower or higher than the expected figures. For practical purposes the transformation of the variable may be useful. We suggest the whole rounded number resulting from the multiplication by 50 and addition of 50. In this case we would have a whole number between 0 and 100. In the example above, it would be $(-0.5*50+50) = 25$.

The general formula of the main equation ($g_{am}(3)/g_{bm}(4)$) is:

$$PP = \frac{cp - \frac{pp.rp}{n-1}}{rp - \frac{rp.rp}{n-1}} = \frac{(n-1).cp - pp.rp}{(n-1).rp - rp^2} \tag{5}$$

2.3 Extreme values and correction of zeros

In certain circumstances, the denominator of the fraction can be equal to zero, making the division impossible. This can happen in extreme and rare situations, when the number of received choices will be equal to zero (the neglected members) or equal $n-1$ (the most popular members, thus chosen from all the others). This problem can be solved by adding 0.001 to *rp*, whenever this variable is equal to $n-1$ or 0. In the case of $n-1$ choices, the index will vary between 1 and 0, depending on if all or less real choices are perceived. In the case of null choices, the index will be lesser the more perceptions are transmitted. If the neglected members emit 0 perceptions, there will be a division of 0 by 0, which will have to correspond to index 1. Computer programs can do this easily (see Appendix).

2.4 Developing composite indices

To get more information from the sociogram, we may also measure inverse perceptions. This is the case where a subject thinks that he is preferred by a member who actually rejects him. The key value will thus be the number of perceived preferences which match the actual rejections (*inverse perceived preferences* or *ipp*), also counted on the vertical axis of the matrix. Figures of formula *(5)* can be applied, but, besides using *ipp* instead of *cp*, received rejections (*rr*) should replace received preferences (*rp*). Thus, we can have the *inverse index of Positive Perception*:

$$iPP = \frac{(n-1).ipp - pp.rr}{(n-1).rr - rr^2} \tag{6}$$

By itself, this index only detects special situations of misunderstanding. Assuming that people do not misunderstand rejections as preferences, it can be expected to be negative, although it would theoretically range between −1 and +1. For an example, C (Claire) will have:

$$iPP(c) = \left((7-1)*0-1*1\right)/\left((7-1)*1-1^2\right) = -1/5 = -0.25$$

This new index thus helps to correct the impression, given by the index of positive perception, that Claire is a bad perceiver of others' preferences. She cannot perceive preferences towards her, but she does not excessively misunderstand rejections as preferences. Therefore, if we subtract it from the index of Positive Perception, we get more information from the sociometric matrix, and have a better picture of perception accuracy. For Claire, it will be,

$$cPP(c) = [PP] - [iPP] = (5) - (9) = -0.5 - (-0.25) = -0.25$$

This is a composite index, theoretically ranging between −2 and +2, which we call the C*omposite index of Positive Perception*:

$$cPP = \frac{(n-1).cp - pp.rp}{(n-1).rp - rp^2} - \frac{(n-1).ipp - pp.rr}{(n-1).rr - rr^2} \tag{7}$$

2.5 Composite indices of negative perception and mutuality (positive and negative)

The above reasoning can be applied to other data where reciprocity may be measured. This is the case of *correctly perceived rejections* (*cr*), *mutual preferences* (*mp*) and *mutual rejections* (*mr*) which must replace *pp* (*perceived preferences*) for the first term of each equation, and the number of perceived rejections which match received preferences (*inverse perceived rejections—ipr*), of transmitted preferences which match received rejections (*inverse mutual preferences—imp*), and of transmitted rejections which match received preferences (*inverse mutual rejections—imr)* which must replace *ipp* (*inverse perceived preferences*) for the second term. For both the terms of equations, *perceived rejections* (*pr*), *transmitted preferences* (*tp*) and *transmitted rejections* (*tr*) must be counted instead of *perceived preferences* (*pp*). Also in the second term of each new equation, the same rules apply as for the equation *(6)*: received rejections *(rr)* must replace received preferences *(rp)* for positive indices and *vice-versa* for negative indices. The new indices and respective equations are the following:

a) Composite index of Negative Perception = NP—iNP:

$$cNP = \frac{(n-1).cr - pr.rr}{(n-1).rr - rr^2} - \frac{(n-1).ipr - pr.rp}{(n-1).rp - rp^2} \tag{8}$$

b) Composite index of Positive Mutuality = PM—iPM:

$$cPM = \frac{(n-1).mp - tp.rp}{(n-1).rp - rp^2} - \frac{(n-1).imp - tp.rr}{(n-1).rr - rr^2} \tag{9}$$

c) Composite index of Negative Mutuality = NM—iNM:

$$cNM = \frac{(n-1).mr - tr.rr}{(n-1).rr - rr^2} - \frac{(n-1).imr - tr.rp}{(n-1).rp - rp^2} \tag{10}$$

Each of these composite indices will range between −2 and +2. For practical purposes, we can transform the variable to give a figure of the same magnitude of the single indices. Thus, the whole rounded result of the multiplication by 25 and addition of 50 will give a number ranging between 0 and 100. Assuming a normal distribution, random responses will be expected to be around 50, which results from the transformation of 0.

Computing the data related to example C, we obtain:

$$\boldsymbol{cPP}(c) = \mathbf{-0.25}\,(\textit{as computed before})$$
$$\text{or}\,(-0.25*25+50) = 43.75 \approx \mathbf{44;}$$

$$\boldsymbol{cNP}(c) = ((7-1)*1-3*1)/((7-1)*1*1^2) -$$
$$((7-1)*2-3*4)/((7-1)*4-4^2) = 0.5-0 = 0.5$$
$$\text{or}\,(0.5*25+50) = 62.5 \approx \mathbf{63};$$

$$\boldsymbol{cPM}_{(C)} = ((7-1)*1-3*4)/((7-1)*4-4^2) - ((7-1)*1-3*1)/$$
$$((7-1)*1-1^2) = -0.75-0.6 = \mathbf{-1.35}$$
$$\text{or}\,(-1.35*25+50) = 16.25 \approx \mathbf{16};$$

$$\boldsymbol{cNM}_{(C)} = ((7-1)*0-1*1)/((7-1)*1*1^2) - ((7-1)*1-1*4)/$$
$$((7-1)*4-4^2) = -0.2-0.25 = \mathbf{-0.45}$$
$$\text{or}\,(-0.45*25+50) = 38.75 \approx \mathbf{39}.$$

2.6 Population

These composite indices were studied in virtual groups with randomized choices and with real groups where the sociometric test had been applied. The virtual groups consisted of 315 supposed individuals belonging to 21 groups, which ranged sequentially from 5 to 25 members in each group. After defining the number of members in each group, a computer program randomly decided the preferences, rejections and perceptions, within a mean of choices corresponding to the mean of real groups. The real groups consisted of 311 boys and girls belonging to 12 school classes, ranging from 19 to 30 members (Mean age = 12 years). The sociometric test was applied to each class in the context of another study carried out by one of the authors (Villares-Oliveira 1999). The students were asked who they would choose (or not) to go on a school trip with, and who they thought would choose (or not choose) them.

In each type of group we detected the *popular* and *rejected* members, by means of the number of received preferences or rejections out of the limit defined by the

Table 2 Number and percentage of all sociometric statuses in each population studied[a]

Population	Total	Popular	Average	Rejected	Neglected
Random	315[b]	24 (8%)	*251 (80%)*	30 (10%)	7 (2%)
Real	311	52 (18%)	*167 (54%)*	56 (18%)	36 (12%)

[a] $\chi^2 = 54.6$ (3df) $p < .0001$

[b] 2 members were controversial;

cumulative binomial probability ($p < 0.05$) in each group. The *neglected* members were defined by the social impact ($rp + rr$) under the limit defined by the cumulative binomial probability of $p < 0.05$ (Bahn 1972). The social impact above the limits defines *controversial* members. All remaining members were considered *average*. The number and status of the total members are shown in Table 2.

3 Results

Figure 2 shows the histogram of all the composite indices in the virtual population with randomized choices and in the real population. Normal distribution can be assumed. The standard deviation is nearly the same for both virtual ($SD = 11.3$) and real ($SD = 12.0$) populations. As it was expected, the mean of the indices, wherever the randomized choices were present (virtual population), is about 50. In real populations, the general mean is 60.6. The difference is highly significant ($t = 11.16$, $p < .0001$).

Table 3 compares the means for each composite index belonging to small ($n < 10$) and large ($n > 20$) groups of the virtual population, as well as the means for each sociometric status in this population. No mean is significantly different and, in every circumstance, the 95% confidence interval for mean (mean ± 1.96 x standard deviation divided by the square root of the sample size) includes the value of 50.0.

Finally, Table 4 compares the index means for each sociometric status in the real population. Interestingly, indices that match preferences (*cPP* and *cPM*) tend to be higher than indices that match rejections (*cNP* and *cNM*). All these differences are

Table 3 Mean, standard deviation and 95% confidence interval for mean for each composite index in small ($n < 10$) and large ($n > 20$) groups, and in each sociometric status of the virtual population with randomized choices

	Small groups	Large groups	Popular	Average	Rejected	Neglected
	$N = 35$	$N = 115$	$N = 24$	$N = 251$	$N = 31$	$N = 7$
cPP	48.0 ± 14.7	51.3 ± 9.2	50.4 ± 9.3	49.4 ± 10.9	50.1 ± 8.3	56.0 ± 19.1
	(43.0–53.1)	(49.6–53.0)	(46.4–54.3)	(48.1–50.8)	(47.1–53.2)	(38.3–73.7)
cNP	50.8 ± 15.1	50.5 ± 8.6	48.0 ± 10.5	50.7 ± 10.6	49.4 ± 14.9	53.6 ± 13.5
	(45.6–56.0)	(48.9–52.0)	(43.5–52.4)	(49.4–52.0)	(44.1–55.0)	(41.1–66.0)
cPM	52.6 ± 15.6	48.9 ± 8.6	48.9 ± 11.1	49.8 ± 12.0	50.1 ± 10.7	44.3 ± 18.1
	(47.3−58.0)	(47.3–50.5)	(44.2–53.6)	(48.3–51.3)	(46.3–54.2)	(28.4–59.9)
cNM	53.8 ± 19.1	51.0 ± 9.1	49.2 ± 9.4	51.1 ± 11.3	52.7 ± 8.0	44.1 ± 17.0
	(49.3–58.3)	(49.4–52.7)	(45.2–53.1)	(49.7–52.5)	(49.7–55.6)	(27.7–61.2)

Table 4 Mean and standard deviation of the composite indices in each sociometric status of the real population

	Popular	Average	Rejected	Neglected
	$N=52$	$N=167$	$N=56$	$N=36$
cPP	63.5±7.7	64.1±9.4	66.1±13.0	63.5±11.6
cNP	59.8±13.6	55.5±11.5	57.2±12.2	56.6±11.3
cPM	62.9±8.1	66.9±11.0	65.3±14.0	63.9±12.4
cNM	56.6±12.5	55.8±10.4	54.5±10.8	55.2±12.7

statistically significant [p(t-test) < .003], with the exception of the perception in *popular* members. No other pair of means is significantly different in each group, except for *average* members, where positive mutuality (*cPM*) is significantly higher than positive perception (*cPP*) (t = 2.5, 332 df, $p < .013$), contrary to the general tendency in other groups. Moreover, the means are greater than in the virtual randomized population.

4 Discussion

The sociometric test is easily applied but difficult to decode into a readable form: sociometric matrix and sociogram. This problem may be overcome with computers. It is now time to gather and study all the information provided by this useful tool. This paper explored the concept of *tele* by acquiring individual measures of telic sensitivity, irrespective of the size of the group and the number of received preferences and rejections that define the sociometric status of each member. These measures were developed rationally, but we had to introduce a correction in order to deal with zero numbers.

Application of these measures to virtual populations with randomized choices (Table 2) showed they were effectively independent of the size of the groups and the sociometric status of the individuals. Composite indices are preferable to single indices, as they generate more information. Though in the past they were more difficult to process, this is overcome with computer software. Based on our global results, we can say that an index between 37 and 75 (61±2*12) is acceptable for real people. More or less than this indicates special and rare (less than 5 %) people, who are either extremely accurate regarding others' choices or they misunderstand these choices.

In fact, real people have a higher mutuality and accurate perception (mean = 60.6, see Fig. 2) than does the virtual population with randomized choices (mean = 50.2). Moreno (1959, p. 47) emphasized this phenomenon by comparing the number of reciprocal, "chain", "closed" and "leadership" structures in real groups, against asymmetrical relations in randomized choices. Furthermore, he tried to demonstrate graphically that schizophrenic patients misunderstand the choices that other people direct towards them (Moreno 1959, p. 59). Using these indices in subsequent research, we may expect to sustain such assumptions, and to detect special cases of individual misunderstanding within a group. These would, at least, be people at risk. Returning to our example, subject C (Claire) had three indices within the accepted range (*cPP* = 44; *cNP* = 63; *cNM* = 39), but mutual preferences (*cPM* = 16) were clearly low.

In fact, she was a married woman with an obsessive personality, experiencing a marital crisis. Her husband liked her very much, as did other men, but she complained about the difficulty she had in dealing with them. She conveyed to the psychodrama group her tendency to be attracted to those people who reject her.

The real people in our study are rather more attentive to preferences than to rejections (*cPP*>*cNP*, and *cPM*>*cNM*). This may either be a special characteristic of the youthful population studied or a generic tendency of the healthy human beings. Nevertheless, the difference in perception of positive and negative choices is not significant in *popular* members. This may be a feature of leadership. In fact, popular members have the highest perception indices of negative choices and the lowest positive mutuality, perhaps as a result of performing strategic choices. However, more research is clearly needed. It is interesting to see that indices of perception are generally higher than indices of actual mutuality (*cPP*>*cPM*, and *cNP*>*cNM*, see Table 4) except in *average* members, where the difference is opposite and significant for positive choices. This could mean that *average* people are well engaged in action but don't really think about other people's choices.

Since this is a preliminary study, the above speculations remain to be substantiated in subsequent research. However, they do point to the diagnostic and research possibilities that such comparable indices may have in organizational and clinical psychology. In spite of its susceptibility to conceptual ambiguity, and the lack of attention from psychodramatists, tele may be a central concept in Moreno's theory (Blatner 1994). In view of the fact that several psychodrama techniques rely on tele, this concept deserves further development and research.

Notes

1 The sociometric criterion is the task on which the choices are based. Some examples are: Who do you choose: "to keep a secret?"; "for support in taking risks?"; "to go on a trip with?"; "to generate creative ideas with?". These criteria may be adjusted to the group and be diverse in order to generate different choices in each test. Putatively, they do not influence the indices.

2 Some examples: http://www.hoopandtree.org/sociometry.htm, acceded in JAN/2015; http://www.simonecapretti.it/groupdynamics/, acceded in JAN/2015.

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Appendix

Program (in QBasic) to compute the indices

```
PRINT "For Positive Perception insert cp (Matching), pp (Transmitted), ipp (Inv. match)"
PRINT "For Negative Perception insert cr (Matching), pr (Transmitted), ipr (Inv. match)"
```

```
PRINT “For Positive Mutuality insert mp (Matching), tp (Transmitted), imp (Inv. match)”
PRINT “For Negative Mutuality insert mr (Matching), tr (Transmittes), imr (Inv. match)”
PRINT “For Positive Indices insert first rp (Received), then rr (Inverse received)”
PRINT “For Negative Indices insert first rr (Received), then rp (Inverse received)”
1 INPUT "Number of members "; n
2 INPUT "Matching (cp, cr, mp, mr)"; var1
3 INPUT "Transmitted (pp, pr, tp, tr)"; var2
4 INPUT "Received (rp, rr) "; var3: GOSUB 12
5 PRINT "single index"; index; "="; FIX(index * 50+50)
6 LET indice1=index
7 INPUT "Inverse matching (ipp, ipr, imp, imr)"; var1
8 INPUT "Inverse received (rr, rp) "; var3: GOSUB 12
9 PRINT "inverse "; index; "="; FIX(index * 50+50)
10 PRINT "composite"; index1 − index; "="; CINT((index1 − index) * 25+50)
11 STOP
12 indices
13 IF var3=0 AND var2=0 THEN LET index=1: GOTO 23
14 IF var3=0 THEN LET var3=.001
15 IF var3=n – 1 THEN LET var3=var3+0,001
16 LET numerator=(n − 1) * var1 − var2 * var3
17 LET denominator=(n − 1) * var3 − var3 ^ 2
18 LET index=numerador/denominator
19 RETURN
```

Note: This program is embedded in SOCIOM (http://195.22.18.186/sociom/Tabelas-Dados.aspx)

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