doi.org/10.26398/IJAS.289

WHAT ELICITS EMPATHETIC PERFORMANCE IN DISCOURSE PRACTICES AMONG UNDERGRADUATE STUDENTS? A MULTIDISCIPLINARY PILOT STUDY

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Abstract *In the last few years scholars have started to study the process of operationalizing empathy in professional contexts such as investigative interviewing, medical schools, public administration and engineering. Since empathy is crucial also for politicians, political consultants, journalists and public relations representatives, the present research is meant as a pilot study to assess the empathetic performance of bachelor students at University of Napoli Federico II in Italy. On the basis of survey data collected to investigate respondents' behaviour faced to hypothetic scenarios, a statistical and linguistic study is pursued with Halliday's Transitivity Model and with the analysis of preference rankings to disclose discriminant elements in the elicitation of empathy in different scenarios.*

Keywords*: Empathy; Halliday's transitivity Model; Survey; Data Analysis; Consensus Ranking*

1. THE IMPORTANCE OF EMPATHY IN PROFESSIONAL SETTINGS

Traditionally, the term empathy was used to describe an unconscious reaction to an object involving our projection into it or our physical imitation of it. Then it lost its bodily connotation and started to be used to describe a psychological process. Recently it is related to the concept of sympathy since both describe how an individual can understand other people's feelings even if empathy is "the ability to understand another person's feelings, experience, etc." (https://www.oxfordlearnersdictionaries.com/) while sympathy is "the feeling of being sorry for somebody; showing that you understand and care about somebody's problems" (https://www.oxfordlearnersdictionaries.com/).

Over the years, many articles have been published on the concept of empathy,

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The authors discussed and conceived the paper jointly. Rosaria Simone is responsible for Sections 4 and 6 and Sole Alba Zollo is responsible for Sections 1,2,3 and 5.

offering different definitions, often conflicting, and developing a large variety of methodological approaches[2]. Apart from the different studies on clinical empathy (Greeno et al. 2017; Kim 2020), in particular on the importance of implementing empathy training in medical curriculum (Barnhill Bayne 2011), recently scholars have started to study the process of operationalizing empathy in professional contexts such as investigative interviewing, public administration and engineering. Research suggests that empathy can be helpful during police interviews because it can increase cooperation and help to obtain more detailed information from interviewees. For instance, by analysing a sample of police interviewers' self-reports, Baker-Eck et al. (2020) verified the application of empathy in interviews and definition or understanding of this concept. Moreover, given the lack of understanding of empathy in public administration and absence of method to include the practice of empathy in public services, Edlins (2021) explored the strengths and challenges of the practice of empathy in order to develop a model of empathy for public administration which is able to suggest good practices to improve relational interactions. Also for engineers it can be crucial to improve their degree of empathy especially when they manage project groups. So, according to Rasoal et al. (2012), it can be important also for engineering students to develop their empathic abilities by acquiring both theoretical and practical knowledge.

Since recent studies have shown that empathy is a key component not only for the doctor-patient relationship, the present study aims to analyse the level of empathy in discourse practices among political science undergraduate students through an exploratory study conducted in class between October-December 2019. Emulating the study carried out in Pounds et al. (2017), a survey in English language was administered to bachelor students, including mainly rating and ranking questions tailored to assess which response reaction to a given circumstance would be chosen by the respondent among listed options. On this basis, we discuss a preliminary investigation combining discourse analysis and statistical methods.

The paper is organized as follows: Section 2 recalls the foundation of Halliday's transitivity model; Section 3 reports a detailed description of the survey scheme and the results of the linguistic analysis of questions and available response options. Section 4 describes instead the results of the statistical analysis pursued to test differences in empathetic performances under the different

[2] Hall and Schwartz (2019) provide a review of empathy definitions and usages by examining and comparing two corpora of peer-reviewed journals published between 2001 and 2013, and in 2017.

scenarios and respondents' given gender. Specifically, first Quantile ANOVA (Mair and Wilcox 2020) is applied to test the significance of observed differences in the distribution of the designed empathetic score along its range; secondly, we resort to Kemeny's distance (Kemeny et al. 1962) to determine the so-called consensus ranking and the distance between observed rankings and the most empathetic one (D'Ambrosio 2021). Concluding remarks end the paper.

2. HALLIDAY'S TRANSITIVITY MODEL

According to Halliday's (1985) Systemic Functional Linguistics (SFL), language can have different functions, and among which it is primarily used to express peoples' outer and inner experience. He identifies three meta-functions of language: ideational, interpersonal, and textural. The ideational function is the use of language to communicate effectively, the interpersonal function is the use of language to create and maintain social relations, the textual function is the use of language to signify discourse. The system of transitivity concerns the ideational function. This system has been widely used by scholars to investigate literary and non-literary texts (written and spoken) from a discourse analysis perspective both qualitatively and quantitatively.

In traditional grammar transitivity is a term frequently used. It is a grammatical feature that indicates if a verb takes a direct object (transitive verb) or not (intransitive verb). Halliday introduces a new concept of transitivity where it is not a verbal phenomenon but a clausal one. Since the interpersonal function concerns the linguistic mechanisms of interaction among people such as speech acts, turn-taking and interruption, there is a connection between this meta-function and transitivity. In order to maintain social relationships, speakers not only express their opinions but also try to influence their interlocutors' viewpoints and behaviours. In fact, "a clause is the product of three simultaneous semantic processes. It is at one and the same time a representation of experience (ideational), an interactive exchange (interpersonal), and a message (textual)" (Halliday 1985: 53).

Given this broader definition of transitivity, three components of this process can be identified: the process itself, the participants in the process (animate or inanimate), and the circumstances associated with the process. The process is realized by verbs, which can be related with one or more participants and circumstances of time, space, manner, cause, etc.

As an effective tool for discourse analysis, Halliday (1985) presents a description of English transitivity. He identifies six major types of processes: material, mental, verbal, relational, behavioral, and existential (see Figure 1, left

panel). Thanks to this model, the content of clauses can be more understandable as we will be able to identify the specific process.

Process type	Category meaning	Participants
Material:	'Doing'	Actor, Goal
Action	Doing	'Behaver'
Event	'Happening	
Behavioral:	'Behaving'	
Mental:	'Sensing'	
Perception	'Seeing'	Senser
Affection	'Feeling'	Phenomenon
Cognition	'Thinking'	
verbal:	'Saying'	Sayer, target
Relational:	'Being'	Token, value
Attribution	'Attributing'	Carrier, attribute
Identification	'Identifying'	Identified, identifier
Existential:	'Existing'	Existent

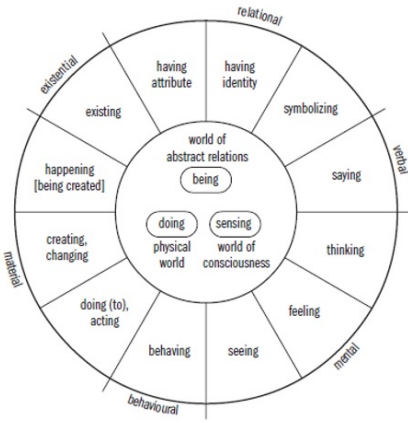

Figure 1: Left: Process types (Halliday 1985: 131). Right: Diagrammatic representation of process types (Halliday and Matthiessen 2004: 172)

There is a distinction between what we experience in the world around us and what we experience in our consciousness. Grammatically these two types of experience are expressed by material process clauses and mental process clauses. In addition, we have a third type of processes, the relational process clauses, since we are able to relate pieces of experience to others. There are also intermediate categories, that is the behavioural process (external manifestations of inner experience), the verbal process (symbolic relationships built in the world of consciousness and enacted in the form of language) and the existential process (phenomena of being or happening). Halliday and Matthiessen (2004) stress out that the process types are fuzzy categories and there is a circular continuity visually represented in Figure 1 (right panel).

SFL has been widely used by scholars to examine linguistic phenomena for many years. This paper adopts the transitivity theory of SFL to analyse the questionnaires used for our pilot study in order to identify the main recurrent processes in it in order to explain their functions of constructing an empathic message. Linguistic choices have significance, and transitivity plays a key role in meaning making. Transitivity can be a powerful instrument to analyse a text,

focusing on agency and action. In particular, by seeing if responsibility is implicit or not, backgrounded or foregrounded, it can help discuss on the effectiveness of the questionnaires and how they can influence participants' responses.

Material processes are processes of doing and happening. They express tangible actions so there is a participant, the actor, who does the deed, which may be confined to the actor itself (e.g. "I went away") or may be extended to another entity, the goal (e.g. "I made a cake"). So we may have two participants: the actor, the doer of the process, and the goal, the participant affected by the process. We can also have material clauses that represent abstract events such as in the sentence "The scholar developed a new approach".

Mental clauses encode processes of cognition and perception expressed by cognitive and perceptive verbs (e.g. "I think you're right", "I feel exhausted"), and affection given by desiderative and emotive verbs (e.g.. "Ann liked the film", "I hate spiders"). These processes are concerned with events that take place in the world of our consciousness and are characterized by two participants: the senser, who is always a being endowed with consciousness, and a phenomenon, which is the entity being sensed, i.e. thought, felt, seen, wanted or perceived.

The third main type of process is the relational one. Relational clauses build the relationships of being and having between two participants. They construct our experience as "being" rather than as "doing" (material clauses) and "sensing" (mental clauses). The concept of "being" is expressed through two distinct modes – attributive and identifying – with different participant roles. In the attributive processes we find a carrier (a noun or noun phrase) who is ascribed or attributed to an attribute (a quality or classification), for example "Ann is kind". In the identifying mode, one entity is used to identify another, so there is an Identified/Token (the element that is being identified) and an identifier/value (the element that defines), for example "Today's meeting is the last opportunity for a deal".

Apart from these three major types of process in the English clause, we can identify other three process types: behavioural (between material and mental processes), verbal (between mental and relational processes) and existential (between relational and material processes).

As stated above, research has widely demonstrated that empathy can be considered a relevant communicative goal in doctor-patient interaction. An empirical study on the topic has been conducted by Pounds et al. (2017) through a discourse-pragmatic approach. Two written tests were designed and trialled with a sample of 58 student volunteers at the University of East Anglia to develop a new empathy-specific admission test for applicants to medical schools. Humanities students rather than medical students were invited to take part in the

experiment to prevent from any bias induced by previous empathy training of medical students. Consequently, based on this research, we have decided to use the same scenarios in a class of political science students in order to verify their level of empathy on some sensitive real-life issues.

3. A SURVEY TO INVESTIGATE EMPATHETIC PERFORMANCE

The following section is devoted to the description of the questionnaire and of its two scenarios (Section 3.1). On this basis, the linguistic analysis of the statements and responses based on Halliday's transitivity model is presented in Section 3.2.

3.1 THE EMPATHY QUESTIONNAIRE

In the context of the course on English language for communication, freshmen in political sciences were involved in a survey study to investigate their empathetic performance. Each participant was asked to rank four reaction options to a series of triggers, from the most preferred to the least one, for two different imaginative scenarios.

In both scenarios the student has to imagine to be a doctor who is meeting a patient in a medical consultation to discuss about two problems: the failing of his/her relationship (Scenario 1) and the death of his/her dog (Scenario 2). The patient makes the statements listed in Table 1 playing the role of empathetic triggers. The students filled in the test for both scenarios:

- Scenario 1: the patient reports the failing of his/her relationship
- Scenario 2: the patient reports the death of his/her pet dog

	Scenario 1	Scenario 2
T1	My girlfriend/boyfriend and I have just broken up and s/he asked me to take my things and leave.	I was walking my dog the other day and he ran away and was hit by a car. We took him to the vet but he died...
T2	I am really devastated that it has ended like this.	I am really upset. I grew up with Charlie. He was such a good dog.
T3	I really love her/him. I don't know how I'll cope.	I really loved him. I don't know what I'll do without him.
T4	I'm such an idiot. You did tell me to be careful.	I feel so guilty. I should have paid more attention. He was a bit blind...

Table 1: Empathetic triggers - scenario 1 and scenario 2

Possible Student/Doctor's reactions for each trigger are reported in Tables 2-5.

	Scenario 1	Scenario 2
A	I'm really sorry to hear this. Let's talk about this later. How did you get on with your diary?	Oh, what a shame... I am really sorry to hear this. These things happen.
B	I'm sorry but this is not surprising to me… I did not think your relationship was very healthy.	Well, I think it is best not to keep dogs in a city. This is bound to happen sooner or later.
C	I'm so sorry! Would you like to talk about it?	Oh dear! How terrible! How long have you had Charlie?
D	I'm so sorry! Do you have anywhere to go? Can anyone help you move out?	Oh no!.. Perhaps you could make enquiries in case anyone has a new puppy they may want to sell.

Table 2: Reactions to Trigger 1 (R-T1) - scenario 1 and scenario 2

	Scenario 1	Scenario 2
A	Sure, but there is no point being upset now. You have to accept the situation.	I understand but it is not like... a relative.
B	You can't be that upset ... After all that s/he has put you through.	I thought you said you didn't like taking him out for walks so early in the morning.
C	Yes, of course, you were not expecting this.	Yes, of course. It's like losing a best friend!
D	Ok, but try not to be upset. You will feel better soon.	Ok, but try not to think about it. Put away all his things so you will not be reminded.

Table 3: Reactions to Trigger 2 (R-T2) - scenario 1 and scenario 2

	Scenario 1	Scenario 2
A	You may have felt like you loved him/her but, actually, you probably just needed him/her!	Are you sure? You can get another dog.
B	I know how you felt about him/her and this must be very hard.	I know he was like a friend to you and this is really hard.
C	Ok, but you need to move on now and there's no point feeling down about it.	I know it's very sad but you didn't see him much now that you are at Uni.
D	I understand but it will be easier once you have moved out of her/his flat.	I know it's sad but you have a lot going for you at the moment. You are at university, making new friends.

Table 4: Reactions to Trigger 3 (R-T3) - scenario 1 and scenario 2

	Scenario 1	Scenario 2
A	You cannot see things straight when you are in love.	It's difficult when the dog is as big as Charlie and pulls in all directions.
B	I know. I did try to warn you.	Well, perhaps you should have... but it is not worth thinking about it now.
C	It's normal for you to feel like this now. You wanted the relationship to work.	Anyone would feel guilty now but, actually, he was lucky to have you as his owner.
D	Maybe…..but I think s/he just took advantage of your good nature.	Perhaps… but you took such good care of Charlie.

Table 5: Reactions to Trigger 4 (R-T4) - scenario 1 and scenario 2

3.2 TRANSITIVITY LINGUISTIC ANALYSIS OF THE QUESTIONNAIRE

In both scenarios, the first trigger is a material process expressed by action verbs (to break up, to take, to leave, to walk, to run away, to die), while the other 3 triggers

are mainly mental and relational (to love, to know, to be devastated, to be upset, to feel guilty) reinforced by the standard emphasiser "really".

By comparing all the response options in both scenarios, it can be noted that most clauses encode processes of cognition and perception expressed by cognitive and emotive verbs (to think, to be sorry).

Finally, by merging the main processes identified and the scenario structure elaborated by Pound et al. (2017: 169), Table 6 shows that only in the trigger "patient's reporting a loss" it is possible to identify material processes. Mental and relational processes are dominant in all other triggers and sought response options.

Trigger		Main verbal processes	Sought response	Main verbal processes
1	Patient's reporting of loss	Material	Eliciting feelings	Mental/relational
2	Patient's explicit expression of feelings	Mental/relational	Acknowledging feelings	Mental/relational
3	Patient's explicit expression of feelings	Mental/relational	Acknowledging feelings	Mental/relational
4	Patient's expression of self-blame and self-deprecation	Mental/relational	Expressing positive regard and neutral support	Mental/relational

Table 6: Scenario structure and Halliday's processes

4. EMPIRICAL EVIDENCE FROM SURVEY DATA

For each of the four triggers listed in Table 1 (each corresponding to a specific dimension of empathy, and thus to the expected reactions schematized in Tables 2-5), four possible statements (coded with letters from A-D) were to be ranked according to their suitability to convey respondents' reaction to the trigger. For both scenarios and for each trigger, the most empathic ranking is R^*=(C,D,A,B), meaning that reaction C is ranked first, reaction D as second, reaction A as third one and B as the last one. Equivalently, we will consider positional order, so that R^*=(3,4,1,2).

For the pilot study discussed in the present contribution, n=131 bachelor students in political science participated in the survey concerning Scenario 1

(n=116 after omitting partial rankings, namely incomplete rankings of at least one of the set of 4 reactions), whereas n=122 students participated in the survey concerning Scenario 2 (n=112 after omitting partial rankings). No ties were allowed neither for Scenario 1 nor for Scenario 2, resulting in a data matrix of linear orderings of m=4 reactions for each possible trigger. Thus, for each of the four triggers t=1,2,3,4, let $R_i^{(t)}=(R_{iA}^{(t)}, R_{iB}^{(t)}, R_{iC}^{(t)}, R_{iD}^{(t)})$ be the ranking provided by the i-th respondent to the 4 possible reactions A-D of the t-th trigger (so that $R_{iX}^{(t)} = 1$ if X is the most suitable reaction, $R_{iX}^{(t)} = 2$ if X is the second best reaction. $R_{iX}^{(t)} = 3$ if X is the second to last suitable reaction and $R_{iX}^{(t)} = 4$ if X is the least suitable reaction).

The goal of the statistical analysis hereafter pursued was first to run a concise introductory exploratory data analysis to illustrate the data at hand: for this purpose, marginal rankings were considered. Then, the following research questions were tackled:

- RQ1: is there any statistically significant difference between the empathetic reactions raised by the two scenarios?
- RQ2: For each scenario, is there any statistically significant difference between responses provided by political science Italian students and those provided by humanities English students?
- RQ3: How far are the observed reactions, to both scenarios, to the most empathetic one $\mathbf{R}^*$?
- RQ4: With reference to the Italian study, which is the most representative ranking for each scenario and each trigger? For each trigger, how far are the corresponding representative rankings in the two scenarios?

Suitable methods to address RQ1 and RQ2 have to be adopted given the ordered nature of the response variable (marginal rankings): in particular, we resorted to Quantile ANOVA (Mair and Wilcox 2020) to determine if there is any significant difference in each marginal ranking distribution at low, medium and high level of the scale, in terms of low, medium and higher order quantiles. Indeed, quantiles are location measures that can always be defined for ordered variables, and they do not depend on the numerical scores given to categories. We used the function 'Qanova' implemented within the R package WRS2, resorting to the Harrel and Davis estimator of quantiles, which is suitable to work also with tied data, as in the case of ordinal outcomes.

Kemeny's distance between rankings was used to tackle RQ3 and RQ4 since it allows to uniquely solve the so-called consensus ranking problem (see Kemeny

and Snell 1962; Emond and Mason 2002): this distance equals 0 if and only if two rankings $\mathbf{R}_i^{(t)}$and $\mathbf{R}_j^{(t)}$ perfectly agree.

In order for the presentation to be self-comprehensive, a concise summary of these statistical tools is provided in a devoted Appendix at the end of the paper (see Section 6).

4.1 A COMPARATIVE ANALYSIS BETWEEN THE TWO SCENARIOS AND WITH RESPECT TO THE ENGLISH PILOT STUDY

Table 7 reports the p-values (adjusted for multiple testing) for the Quantile ANOVA run on the marginal rankings corresponding to each combination of triggers (t=1,2,3,4) and reaction (A,B,C,D). Chosen quantiles are first and ninth decile (D_1 and D_9), first, second and third quartile (Q_1, Q_2, Q_3). It follows that significant differences (at level α=0.05) are found at least in some location of the response for all combination of triggers and reactions, except for T1-C, T3-A, T3-D. For T1-B, T2-A, T2-D, T3-C, the differences are found at the lowest quantiles, indicating that the main differences correspond to the top position of the rankings. Conversely, for T2-C T3-B, T4-C, significant differences between scenarios emerges only at the bottom positions of the rankings (since the test is significant only at the selected higher order quantiles). For other marginal rankings, instead, there is evidence for differences along the entire ranking scale.

In order to perform a comparative analysis with the English pilot study, for each observed ranking – given a trigger – we count the number of positional agreements with the benchmark ranking $\mathbf{R}^*$. More precisely, for each scenario and each trigger t=1,2,3,4, we define $C_i^{(t)}$ as the number of perfect matchings of $\mathbf{R}_i^{(t)}$ with $\mathbf{R}^*$ for the i-th respondent (so that $C_i^{(t)} = 0$ if no matching is found, and $C_i^{(t)} = 4$ in case of a perfect matching: notice that 3 exact matchings imply necessarily $C_i^{(t)} = 4$). Then, we define an individual specific score of empathetic performance as $C_i = C_i^{(1)} + C_i^{(2)} + C_i^{(3)} + C_i^{(4)}$, ranging in set of the positive integers from 0 to 16. For each scenario, boxplots displayed in Figure 2 show the distributions of the empathetic score for the Italian and the English pilot studies in a comparative perspective.

	D_1	Q_1	Q_2	Q_3	D_9
T1 – A	0.000	0.002	0.000	0.000	0.000
T1 – B	0.000	0.000	0.000	0.432	0.432
T1 – C	-	-	0.915	0.190	0.915
T1 – D	0.000	0.238	0.000	0.005	0.040
T2 – A	0.000	0.000	0.000	0.455	0.455
T2 – B	0.843	0.843	0.843	0.000	0.8433
T2 – C	0.455	0.455	0.000	0.000	0.000
T2 – D	0.000	0.000	0.687	0.063	0.040
T3 – A	0.053	0.175	0.465	0.465	-
T3 – B	-	0..4933	0.007	0.000	0.000
T3 – C	0.000	0.000	0.448	0.245	0.448
T3 – D	0.857	0.857	0.857	0.857	0.857
T4 – A	0.000	0.000	0.000	0.000	0.000
T4 – B	0.712	0.170	0.712	-	-
T4 – C	0.477	0.477	0.000	0.000	0.000
T4 – D	0.100	0.397	0.000	0.397	0.145

Table 7: p-values for Quantile ANOVA to compare the results with Pounds et al.'s findings

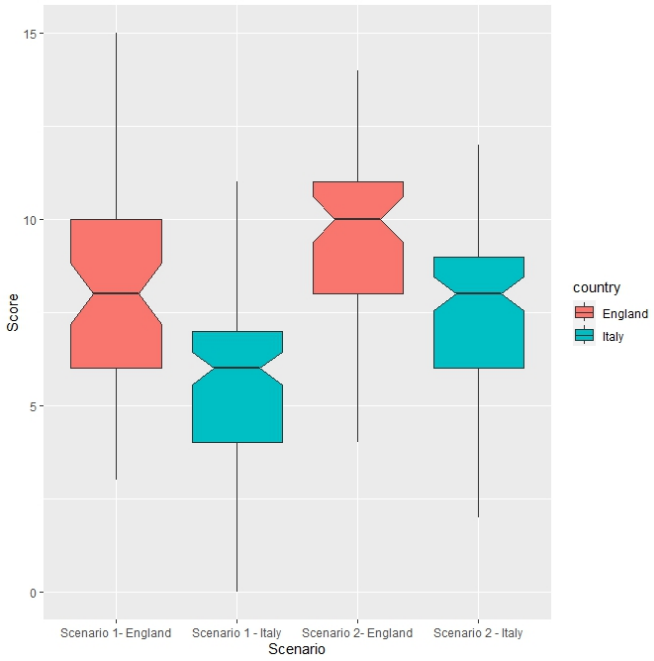

Figure 2: Graphical comparison of the distribution of the empathetic score for the Italian and English pilot study

From this exploratory analysis, it follows that empathetic reactions are poorer for Italian than for English students for both scenarios (to a greater extent for the first scenario). Then, we further investigate this evidence by performing a Quantile ANOVA on the merged score samples with an auxiliary dummy variable D_i flagging English scores (D_i=1) against Italian scores (D_i = 0). Results indicate highly significant differences at each of the selected quantiles for both scenarios (except for the first decile of the first scenario): for the sake of completeness, Table 8 reports the observed quantiles. With reference to the Italian study, it is worth noticing also that observed differences in the total empathetic score between the first and second scenario are statistically significant as well.

	D_1	Q_1	Q_2	Q_3	D_9
S1 – ITA	3	4	6	7	8
S1 – ENG	4	6	8	10	13
S2 - ITA	4	6	8	9	10
S2 - ENG	6	8	10	11	12

Table 8: Selected quantiles of the total empathetic score, for each scenario: comparison between the Italian and English pilot study

4.2 KEMENY'S DISTANCE WITH FULL EMPATHETIC RESPONSE

Figure 3 shows the boxplots of the distribution of Kemeny's distance between the observed rankings and the benchmark ranking **R*** corresponding to a perfectly empathetic reaction, for each trigger. It follows that there are no particularly manifest differences between the two scenarios, except for a more empathetic reaction raised by the first and last triggers (elicitation of feeling and expression of positive regard - mental support) under Scenario 2 than under Scenario 1.

Similarly, it can be observed that distances to the fully empathetic reaction tend to be larger under Scenario 1 than under Scenario 2 for the primary trigger of acknowledgment of feeling (T2), whereas the converse is true for the secondary trigger of this dimension (T3).

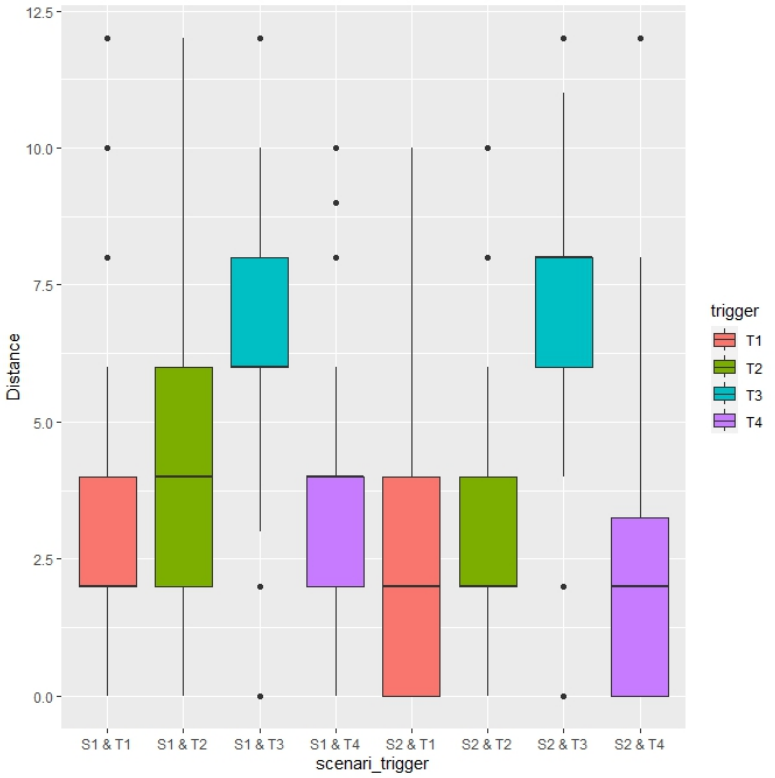

Figure 3: Boxplot of Kemeny's distance between observed ranking and full empathetic response, for each trigger and scenario

4.3 DETERMINING TRIGGERS' CONSENSUS RANKING AND THEIR DISTANCE

Table 9 reports the consensus ranking for each combination of trigger and scenario, so that Tx & Sy corresponds to the combination of the x-th trigger, for x=1,2,3,4, with the y-th scenario, y=1,2. Each row in the Table refers to one of the listed reactions. The consensus ranking[3] – namely the ranking that best represents the observed ones – has been obtained by means of the algorithm implemented in the R package 'ConsRank' (D'Ambrosio, 2021).

[3] See Amodio et al. 2016 for an overview of the consensus ranking problem and of some recent solutions.

	T1&S1	T1&S2	T2&S1	T2&S2	T3&S1	T3&S2	T4&S1	T4&S2
A	4	2	3	4	4	4	1	3
B	3	4	4	3	1	1	4	4
C	1	1	1	1	3	3	2	1
D	2	3	2	2	2	2	3	2

Table 9: Consensus ranking for each trigger and for each scenario

It follows that the consensus ranking fully matches with **R*** only for T2&S1 (acknowledging feeling for Scenario 1) and for T4&S2 (Expressing positive regard and neutral support for Scenario 2). Finally, Kemeny's distance has been computed between the consensus rankings of the two scenarios, for each trigger (see Table 10). It follows that the consensus reaction elicited by the third trigger (secondary acknowledgement of feeling) is the same between the two scenarios, whereas the two scenarios differ mostly, starting from the major consensus, for the elicitation of feeling (T1) and the expression of positive regard and neutral support (T4).

T1	T2	T3	T4
4	2	0	4

Table 10: Kemeny's distance between the consensus rankings of the two scenarios, for each trigger

Notice that it has not been possible to run a comparative analysis between the two studies in terms of consensus ranking, having only the distribution of empathetic scores in Pound et al. (2017), and not the individual ranking responses.

5. CONCLUSIONS

The goal of the present paper was to propose a combined linguistic and statistical analysis of survey data to assess empathetic performances among university students. Halliday's transitivity model allowed to identify the main verbal processes present in the questionnaire. The linguistic analysis revealed that, apart from the trigger "patient's reporting a loss" which contains material processes, all other triggers and sought responses consist of mental and relational clauses, encoding processes of cognition and perception. The statistical data analysis demonstrated that the two scenarios elicit fairy different empathetic reactions only

with respect to elicitation of feeling and expression of positive regard – mental support. In particular, the first scenario seems to entail poorer empathetic performances: in general, empathetic reactions are poorer for Italian than for English students for both scenarios.

As empathy is more and more acknowledged as a desired professional skill in all domains, from medicine to politics, this research may be the starting point of further interdisciplinary and empirical studies to measure university students' empathic communicative performance and suggest appropriate interventions that can improve students' ability to communicate empathetically.

6. APPENDIX

This section is meant to provide a concise explanation of the main statistical methods that have been used for the present analysis. The reader is referred to the bibliography items quoted within the text for details.

6.1 KEMENY'S DISTANCE AND CONSENSUS RANKING

Given m objects $o_1,o_2,\ldots,o_m$, there are m! rankings, each of which correspond to a permutation of the objects (in our case, objects are the m=4 possible reactions to a given trigger). To determine Kemeny's distance between a pair of rankings, first, for every ranking R, one defines an m-dimensional score matrix S_R so that, for each pair of positions i,j=1,…m, $S_R(i,j)=1$ if o_i is preferred to o_j, $S_R(i,j)=-1$ if o_j is preferred to o_i, and $S_R(i,j)=0$ in case of ties. Then Kemeny's distance between two rankings R and T, is given by:

$$d(R,T) = \sum_{i=1}^{m}\sum_{j=1}^{m} |S_R(i,j) - S_T(i,j)|$$

assuming Kemeny's axiomatic approach to distance between two rankings, and that all positions are equally weighted (namely, differences are treated equally if they occur at the top, at the center or at the end of the scale). In this framework, given n rankings of the 4 possible reactions to a given trigger, the search for the consensus ranking aims at determining the ordering of the reactions that best represents the consensus opinion. Specifically, given Kemeny's distance, a ranking P is defined the consensus ranking if it corresponds to the minimum sum of distances d(R,P) over all possible rankings R. Several algorithms have been proposed in the literature to pursue this task. For our analysis and for illustration purposes, we have resorted to the methods implemented in the R package 'ConsRank' (D'Ambrosio 2021). For a recent discussion on a re-characterization of Kemeny's distance and its properties for general weak orderings, see Can and Storcken (2018).

6.2 QUANTILE ANOVA

Quantile ANOVA is a non-parametric statistical test of hypothesis to assess if two groups of responses of a given (numeric or ordered) variable differ at a given set of locations determined by quantiles (Mair and Wilcox 2020). Significant results imply that the distributions of the two groups at the tested quantiles are genuinely different: for instance, if the test is performed to check the difference in three quartiles but only the difference at the first quartile is significant, then one concludes that there is evidence of the distributions of the two groups to differ only at the lower tail. Being a non-parametric method, its application does not require any assumption on the probability distribution of the response. To give some computational details, the function 'Qanova' relies on a test for the equality of linear contrasts of selected location measures among J independent groups of observations. In our analysis, we considered the simple differences of quantiles between J=2 groups. For each quantile, the test generates bootstrap replicates of the sample to obtain replications of the quantile differences in the two groups; then, it computes a given distance (for instance, Mahalanobis) from the observed quantile difference to each bootstrap difference and to the benchmark zero vector (corresponding to the null hypothesis of no difference). Then, the bootstrap p-value is determined as the number of times the distances based on bootstrapped differences are lower than the benchmark distance between the zero vector and the observed quantile difference in the two groups. For more than one quantiles, these p-values are then corrected for multiple testing, using Hochberg procedure, for instance. No assumption is required on the distribution of the response, nor on the differences in quantiles.

A further approach would be to assess the significance of quantile differences with bootstrap confidence intervals, by means of the function 'qcomhd' implemented in the same R package. Both methods allow to use Harrel-Davis estimates of quantiles and are suitable when tied values may occur. For our analysis, these two approaches provided equivalent conclusions, yet 'qcomhd' is slightly more demanding than 'Qanova' in terms of computational times. A further approach would be to consider the R package 'Qtools' (Geraci, 2016; Geraci and Farcomeni, 2023) which implements the mid-conditional quantile regression suitable to deal with discrete variables.

Disclosure statement: *The authors report there are no competing interests to declare.*

Data availability statement: *Data are available upon request from authors.*

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