

French translation and validation of the Jefferson Scale of Empathy - Health Professions Student version

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received : 25 April 2023
accepted: 29 August 2023

ISSN: 2823-989X
DOI: 10.52057/erj.v3i1.34

ABSTRACT

Background: Background: Jefferson Scale of Empathy is one of the most widely used tools worldwide to assess empathy. The extended version for Health Professions Students (JSE HPS) has not yet been translated into French. **Objective:** The aim of our study was to translate the JSE HPS into French and assess the psychometric properties of this new version (JSE HPS Fr). **Methods:** The JSE HPS was translated according to international recommendations. The main psychometric qualities (test-retest reliability, internal consistency, floor and ceiling effects and construct validity) were studied in a sample of physiotherapy students. Participants provided general information (age, gender, year of study) and completed the JSE HPS Fr and the Questionnaire of Cognitive and Affective Empathy (QCAE). Participants were also asked to complete the JSE-HPS-Fr again one week later to assess its test-retest reliability. **Results:** 408 students (161 males and 247 females; mean age: 21.3 years) participated. The JSE HPS Fr demonstrated good test-retest reliability for the total score (ICC=0.81) and good internal consistency (α Cronbach: 0.79). The JSE HPS also showed good convergent validity with the QCAE questionnaire ($r=0.41$, $p<0.05$). No floor or ceiling effects were observed. **Conclusions:** The results indicate that the JSE HPS Fr is a valid and reliable tool to assess the level of empathy of French-speaking physiotherapy students.

KEYWORDS: empathy, validity, surveys and questionnaires, physiotherapy, students

Introduction

Empathy is a commonly used term, but the concept is also often misunderstood concept. It is commonly defined as the ability to "put yourself into someone else's shoes", but it is much more complex than simply matching the emotions of others with your own. Decety et al.[1] defines empathy as the ability to feel an appropriate emotion in response to that expressed by another, while clearly distinguishing between self and other (i.e. being aware of the source of the emotion and being able to decode the emotion of the other) and being able to regulate one's own emotional responses. Empathy is therefore about trying to understand a person's feelings and demonstrating that understanding through appropriate verbal and non-verbal responses.

In an article about the effects of empathy, Lecomte describes in 2010 [2] several benefits when a health care practitioner (HCP) listens to a patient in an empathetic way: patients' satisfaction, improvement of physical health, psychological well-being, compliance with prescriptions, and a decrease in legal proceedings in case of medical errors. According to Howick et al.[3], empathy could even have similar effects to pharmacological treatments by decreasing pain by 1-2 points on a visual analogue scale. Empathy is therefore an essential dimension at the heart of the interaction between HCPs (doctors, physiotherapists, nurses, psychologists, etc.) and patients.

Numerous questionnaires have been developed to assess empathy in the general population, as well as in specific populations (such as adolescents or health professionals)[4]. Among these, the Jefferson Scale is one of the most widely used tools, worldwide. Developed by Hojat et al.[5], the original Jefferson Scale of Empathy (JSE) measures empathy in physicians, and all other health professionals involved in patient care in a clinical setting (JSE HP-version [6]). A student version was later

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developed to evaluate empathy in medical students (JSE S-version [7]) and another one for health professions students (JSE HPS-version [8]). The JSE has been translated into 59 languages/dialects and has been used worldwide (in at least 85 countries) <https://www.jefferson.edu/academics/colleges-schools-institutes/skmc/research/research-medical-education/jefferson-scale-of-empathy.html>. Conversely, the extended versions of this questionnaire have been less frequently translated.

As no French version of the JSE HPS is currently available, the aims of this study are to translate the Jefferson Scale of Empathy – Health Professions Student (JSE HPS) into French, and to validate this new version (JSE HPS Fr) in a population of physiotherapy students.

Method

The present study was carried out in two stages. The first one was the cross-cultural translation of the English JSE-HPS into a French version (JSE HPS Fr). The second stage was designed to examine the main psychometric properties of the JSE HPS Fr. The JSE was used in this study with permission from Thomas Jefferson University.

Cross-cultural translation

After contacting the Jefferson University to obtain the original scale (in English) and request their permission to translate it into French, the translation of the questionnaire followed several phases according to Beaton et al.[9]. The first step was to translate the scale from its original language (i.e. English) into the desired language (i.e. French). Two translators (bilingual, native French speakers, one being a physiotherapist and the other a psychologist), each provided a translation of the original version independently. The two translators then met to compare their translations and discuss the issues raised during the process. This stage led to a synthesis of the translations and to a first JSE HPS Fr version.

The next step consisted of a back-translation carried out independently, by two bilingual English-French speakers (one being a psychologist and the other a professor), who translated the first JSE HPS Fr version back into English, (blind condition, i.e. without having seen the original English version). Then, the two back-translations were compared to the original version during a meeting with the research team including all translators and an expert in the field (linguist). Differences in translation were discussed and, if there was any doubt about the meaning of the items, the authors of the original scale were contacted to ensure their correct understanding. A linguist checked the wording of the items and their conformity to French culture without sacrificing the key concepts. Finally, a pilot study was conducted with 22 Belgian healthcare university students to test the clarity and understanding of the items. If necessary, some changes were carried out and the final version of the JSE HPS Fr was then created and submitted to Jefferson University for final approval.

Evaluation of the psychometric properties of the JSE HPS Fr

Following the principles of the Consensus-based Standards for the Selection of Health Status Measurement Instruments (COSMIN) recommendations [10], the following psychometric properties of the French version of the empathy scale (JSE HPS Fr) were examined: test-retest reliability, internal consistency, floor and ceiling effects and construct validity.

Participants All physiotherapy students enrolled during the year 2020-2021 at the University of Liège (n=914) were invited to participate in the study (from early bachelor to master). Participants who agreed to take part, signed a consent form before data collection. The study was granted ethics approval from the Ethical Committee of the University of Liège.

Experimental procedure Participants were recruited through email and social networks as the majority of the courses were online distance learning due to the Covid-19 pandemic. They were invited to complete a battery of questions via a secure platform. It included some demographic information (age, gender and year of study), the JSE HPS Fr and another empathy rating scale i.e., the Questionnaire of Cognitive and Affective Empathy (QCAE), to examine the JSE HPS Fr's construct validity. One week after, students who had completed the first form were invited to complete the JSE HPS Fr a second time to assess its test-retest reliability. Participants were given a unique number to identify them in the test-retest situation.

Questionnaires The JSE HPS Fr is composed of 20 questions: ten on perspective, eight on compassion and two on the therapist's ability to see things from the patient's point of view. Each question is rated on a 7-point Likert scale ranging from 1 ("Strongly Disagree") to 7 ("Strongly Agree"). The total score is obtained by adding up the score of each item. The higher the score the greater the empathy (score range: min=20 to max=140). For some questions (No. 1, 3, 6, 7, 8, 11, 12, 14, 18, and 19) the scores must be reversed to calculate the total score [5]. The QCAE, developed by Reniers et al.[11], consists of 31 items for which participants are asked to indicate their degree of agreement using a 4-point Likert scale ("Strongly agree", "Somewhat agree", "Strongly disagree" and "Strongly disagree"). The QCAE has five subscales (two for cognitive empathy and three for affective empathy). The total score ranges from 31 (reflecting low empathy) to 124 (reflecting high empathy). We used the French validated version of the QCAE [12].

Statistical analysis

All statistical analyses were carried out using the IBM SPSS Statistics 27.0.1.0 software. Normal distribution of quantitative variables was checked by using the Shapiro-Wilk test. Quantitative variables that were normally distributed were expressed as mean \pm standard deviation (SD), and quantitative variables that were not normally distributed were expressed as median (and interquartile range, percentile 25-75). The results were considered statistically significant at the 5% critical level.

The floor and ceiling effects were analyzed by calculating the percentage frequency of the lowest or highest possible score achieved by respondents. Floor and ceiling effects of less than or equal to 15% were considered acceptable [13].

One-week test-retest reliability was assessed using the intraclass correlation coefficient (ICC, two-way mixed, absolute agreement) and the 95% confidence interval. Test-retest reliability improves as the ICC approaches 1, and an ICC of greater than 0.7 is indicative of an acceptable reliability [13]. The standard error of measurement (SEM, which provides a range around the observed value in which the theoretical true value can be found) and the minimal detectable change (MDC, which indicates the amount of change that needs to be measured to be sure that the change measured is real and not due to a potential measurement error) of the JSE HPS Fr were also calculated. The standard error of measurement was calculated by dividing the standard deviation of the difference between test and retest scores by the square root of 2 ($SD_{diff} / \sqrt{2}$). The smallest detectable change was calculated by multiplying $1.96 * SEM * \sqrt{2}$ [14]. The Limits of Agreement (LOA) were also determined according to the method of Bland and Altman, which makes it possible to evaluate a bias between the differences in means and to estimate an interval of agreement in which 95% of the differences between test and retest lie [15].

Cronbach's alpha coefficient was used to estimate the internal consistency. We also assessed the impact of deleting each item on the internal consistency. Cronbach's alpha coefficient varies between 0 and 1 and allows us to appreciate the degree to which the items of a questionnaire measure the same attributes or dimensions. The more the items are related to each other, the higher the alpha coefficient. A Cronbach's alpha between 0.70

Table 1 Characteristics of the population and responses to questionnaires (n=408)

	Mean \pm SD	n, %
Age (year)	21.3 \pm 2.51	
Gender		
Women		247 (60.5)
Men		161 (39.5)
Year of study		
1 st year of bachelor		91 (22.3)
2 nd year of bachelor		130 (31.9)
3 rd year of bachelor		85 (20.8)
1 st year of master		102 (25.0)
JSE HPS Fr questionnaire		
Total score	107 \pm 12.4	
Perspective domain	53.5 \pm 7.42	
Compassion domain	45.5 \pm 6.15	
Putting Yourself in the patient's shoes	9.0 \pm 2.48	
QCAE questionnaire		
Total score	89.3 \pm 8.3	
Cognitive empathy		
Perspective taking	29.7 \pm 4.39	
Online simulation	27.1 \pm 3.15	
Affective empathy		
Emotional contagion	11.4 \pm 2.37	
Proximal responsivity	12.1 \pm 2.13	
Peripheral responsivity	9.08 \pm 1.32	

and 0.95 reflects good internal consistency [13]. Correlation coefficients were also calculated to measure the correlation between the total score of the questionnaire and scores of individual domains. Spearman or Pearson correlations coefficients were used depending on the distribution of the variables (normal or not). Correlation coefficients less than 0.3 were considered as weak correlations; between 0.3 and 0.6 as moderate correlations and higher than 0.6 as strong correlations [16].

Finally, construct validity was also assessed by the Spearman or Pearson correlations according to the distribution of variables. Three hypotheses were developed to test correlations between the JSE and the QCAE questionnaires. Significant and positive correlations were therefore expected between: 1) the total scores of both questionnaires; 2) the compassion domain of the JSE and the affective empathy domain of the QCAE, and 3) the perspective domain of the JSE and the perspective domain of the QCAE. Construct validity was considered as good if at least 75% of the hypotheses were confirmed.

Sample size

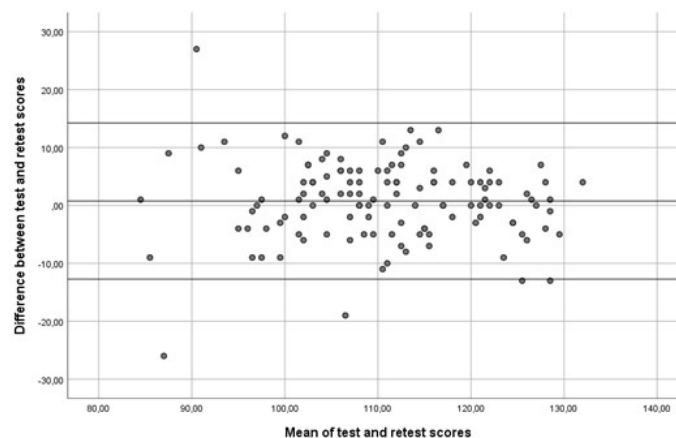
A sample size power calculation was possible for reliability analysis since this is one of the most frequently used measurement properties. Considering an alpha error of 0.01, a statistical power of 0.9, and an expected ICC of 0.85, a total of 100 participants was required [17]. This sample

size is in line with COSMIN recommendations [10].

Results

Translation

The translation of the JSE HPS into French generally went well but some issues were encountered. Firstly, initially, the translators hesitated between "professionnels de la santé", "soignants" and "prestataires de soins de santé" to translate "health care providers". In order to remain faithful to the original version, they opted for "prestataires de soins de santé". However, after back-translation, they decided to replace this term with "professionnels de la santé" to keep the idea of "health care" and to avoid including mutual insurance companies or similar organisations in the notion of providers. Secondly, in the translation, the terms "attention" and "attentiveness" were both translated as "attention". After back-translation, the expression "The fact of being attentive to" was used for "attentiveness" to mark the difference, however subtle, with "attention". The latter referring more to an action, whereas "attentiveness" is more a quality of the person. Third, for the translation of "cured" in item 11, three proposals were put forward: "soignées", "guéries" and "traitées" and the first one was adopted. During back-translation, this term was translated as "cured" and "treated". The translators finally chose "cured" in order to keep the idea of complete healing found in the verb "cure" as opposed to "treat" which refers to an improvement of the condition, without curing. Finally, for question 18 we decided to contact Jefferson University for further clarification about the meaning. Translation was therefore finalised according to their advice. After providing a first translated version, the French linguist made some suggestions and remarks to achieve a first final version of the JSE HPS Fr. This version was further pre-tested on 22 students. Only slight additional changes were necessary to obtain the final version of the French translation. The Jefferson University approved the final version.

**Figure 1** Figure 1: Bland and Altman plot for test-retest reliability

Characteristics of the population

Four hundred and eight physiotherapy students (45% of the approached sample) of the University of Liège (ULiège) participated in the study (161 males and 247 females) with a mean age of 21.3 \pm 2.51 years (min 18 - max 34) **Table 1**.

Psychometric properties

Floor and ceiling effects None of the respondents obtained the minimum score of 20 or the maximum score of 140 on the questionnaire, indicating the absence of floor and ceiling effects.

Table 2 Internal consistency and test-retest reliability

	Cronbach's alpha	Internal consistency (n=408)		Test-retest reliability (n=124)
		Cronbach's alpha for total scale if domain removed	correlation with total score	ICC (95% CI)
Total score	0.79			0.81 (0.74 - 0.86)
Perspective	0.69	0.69	0.82, p<0.001	0.78 (0.70 - 0.84)
Compassion	0.72	0.66	0.84, p<0.001	0.71 (0.61 - 0.78)
Putting yourself in the patient's shoes	0.64	0.80	0.31, p<0.001	0.62 (0.50 - 0.72)

Internal consistency Cronbach's alpha was 0.79 for the entire questionnaire, indicating good internal consistency (Table 2). Lower Cronbach alphas were found for individual domains; 0.69 for the "Perspective" domain, 0.72 for the "Compassion" domain and 0.64 for the "Putting yourself in the patient's shoes" domain. However, positive and significant correlations were found between individual domains and total score; $r=0.82$ between total score and "Perspective" domain, $r=0.84$ between total score and "Compassion" domain and $r=0.31$ between total score and "Putting yourself in the patient's shoes" domain (all p-values <0.01).

Construct validity Significant and positive correlations were found between the total score of the JSE HPS Fr and the total score of the QCAE (Spearman $r=0.41$, $p<0.001$, i.e. moderate correlation); between the Compassion domain of the JSE HPS Fr and the Affective empathy scale of the QCAE (Spearman $r=0.16$, $p=0.001$, i.e. weak correlation); and between the Perspective domain of the JSE HPS Fr and the Perspective Taking domain of the QCAE (Spearman $r=0.31$, $p<0.001$, i.e. moderate correlation).

Test-retest reliability 124 students completed the JSE HPS Fr again one week later and were included in the test-retest analyses. The ICC indicated good reliability for the total score (ICC 0.81, 95%CI 0.74-0.86). A low test-retest reliability was found for the "Putting yourself in the patient's shoes domain" (ICC 0.62, 95% CI 0.50-0.72) (Table 2). Regarding the total score, a SEM of 4.87 points and an MCD of 13.5 points were measured. The mean difference between test and retest was of 0.758 (LOA inf -12.7, LOA sup 14.2) (Figure 1).

Discussion

The scientific literature on healthcare often addresses the concept of empathy. However, this topic is still insufficiently explored, especially in physiotherapy [18]. Yet, empathy is considered essential to create a positive relationship between therapist and patient, allowing in particular to improve the patient's experience and adherence to treatment [19]. Raising awareness of the importance of empathy among (future) health professionals is therefore necessary from the beginning of their studies. Although questionnaires examining the level of empathy already exist in French, the translation of the JSE-HPS [8, 20] was relevant given its specific adaptation to allow the assessment of medical and paramedical students.

The translation process followed the methodology recommended by Beaton et al. [9]. No major difficulties were encountered during this process. Furthermore, 408 students participated in the validation study. Results revealed an acceptable construct validity, estimated by comparing the JSE-HPS to the QCAE questionnaire. Despite being significant, correlations were weak to moderate. This could be explained by the difference in the population targeted by the two tools. The QCAE was indeed designed to assess cognitive and affective empathy in the general population [11] whereas the JSE-HPS is used to assess the level of empathy in students in the health fields [6]. Internal consistency

(assessed using the Cronbach's alpha coefficient) was good for the total score. Internal consistency of individual domains was over 0.7 for the "Compassion" domain but lower than 0.7 for both other domains. Our results highlighted a lower internal consistency compared to that reported for the English version (0.89)[6]. The test-retest reliability of the JSE-HPS Fr was studied on 124 students who completed the Jefferson scale a second time one week later. The sample size used is larger than that generally recommended for testing the reproducibility of a questionnaire. The one-week delay between the test and the retest is commonly used for questionnaires validation [13]. The reliability of the total score, assessed by means of the ICC, showed good test-retest reliability of the scale. Our results confirm those of Hojat et al. who reported ICCs around 0.70-0.80 in almost all studies conducted in the USA and abroad with the JSE [6]. The ICC for the 'Perspective' and 'Compassion' scores (0.78 and 0.71 respectively) indicates moderate reliability, while the ICC for the 'Putting yourself in the patient's shoes' score suggests lower reliability (0.59). A SEM of 4.87 points and a MDC of 13.5 points were measured. The minimal detectable change means that the total score of the scale would have to change by at 13.5 points before we can be sure that this score improved/deteriorated. To our knowledge, this is the first time that the SEM and the MDC values were provided for the JSE-HPS version of the questionnaire.

Few studies have examined the level of empathy in physiotherapy students [21, 22, 23] and, to our knowledge, this is the first study in French-speaking Belgium. The total empathy score reached 107.8 ± 12.4 points. In most studies using the JSE, the mean scores of the different versions of the scale are around 112[6], which suggests that the score in our study is slightly lower than the average. One hypothesis for this is that our study was performed during the Covid-19 pandemic. It is therefore possible that the empathy score was lower due to stress and lower quality of life during this period but also because teaching was mainly conducted remotely, as those factors have been shown to influence empathy levels [24, 25].

An American study showed that physiotherapy students had a slightly but significantly higher empathy score on the JSE-HPS than other health disciplines [26]. This difference in scores could be explained by the fact that physiotherapy students are in contact with patients from mid-way through the bachelor's degree. On the contrary, another study [27] highlighted lower scores for physiotherapists compared to HCP in other disciplines such as psychology, psychiatry or paediatrics, which could be explained by the fact that physiotherapists do not focus on the concept of empathy as much as psychologists, psychiatrists and paediatricians during their training.

Reassuringly, the vast majority of our 408 respondents (96.49%) seem to have a biopsychosocial (and not purely biomechanical) approach by agreeing with the idea that attention to patients' emotions during the interview with the patient is important. On the other hand, it appears surprising that a large proportion of them seem to find it difficult to put themselves in the patient's shoes, as suggested by the poor scores on items three and six of the "Putting oneself in the patient's shoes" subscale.

Some studies have shown that empathy is not a stable personality trait and can be improved by educational interventions [28, 29, 30]. Training to maintain and improve empathy in physiotherapy students at the University of Liege could be relevant.

Strengths and limitations of the study

Despite its originality and the size of the sample used, our study has certain limitations. A selection bias cannot be excluded given the health context. The students could not be met directly and were invited to fill in an online form. Thus, only students interested in empathy could have responded to our survey. Although it was explained that there were no right or wrong answers to the scale used, a desirability bias cannot be ruled out either.

Also, sensitivity to change was not measured because of the cross-sectional design of this study. Further studies should be conducted to examine the sensitivity to change of the scale and to investigate the level of empathy with students from other health care fields.

Conclusion

Our study allowed us to develop a French version of the Jefferson Scale of Empathy - Health Professions Students (JSE-HPS) with moderate convergent validity, good test-retest reliability, moderate internal consistency, and no floor or ceiling effects.

Statement and declaration

Authors' contribution

The authors confirm contribution to the paper as follows: Study conception and design: CM, PEN, FS and CD. Translation: CM, CD, PEN and FS. Back translation: FJG, JF, CM, CD, PEN and FS. Data collection: PEN and FS. Analysis and interpretation of results: CM, PEN, FS, CD, CB, FJG and JF. Draft manuscript preparation: CM and CB. All authors reviewed the results and approved the final version of the manuscript.

Acknowledgments

We thank all participants who agreed to take part in this study.

Disclosure statement

Authors declare that they have no conflict of interest with regard to the content of this manuscript.

Ethics

The study was approved by the Ethical Committee of the University of Liège.

Consent to participate

Informed consent was obtained from all individual participants included in the study

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability statement

The french version of the questionnaire is available by the Thomas Jefferson University.

References

- [1] Jean Decety. Empathy in medicine: what it is, and how much we really need it. *The American journal of medicine*, 133(5):561–566, 2020. doi: 10.1016/J.AMJMED.2019.12.012.
- [2] Jacques Lecomte. Empathie et ses effets. *Savoirs et soins infirmiers*, (60-495), 2010.
- [3] Jeremy Howick, Andrew Moscrop, Alexander Mebius, Thomas R Fanshawe, George Lewith, Felicity L Bishop, Patriek Mistiaen, Nia W Roberts, Eglė Dieninytė, Xiao-Yang Hu, et al. Effects of empathic and positive communication in healthcare consultations: a systematic review and meta-analysis. *Journal of the Royal Society of Medicine*, 111(7):240–252, 2018. doi: 10.1177/0141076818769477.
- [4] Felipe Fernandes de Lima and Flávia de Lima Osório. Empathy: assessment instruments and psychometric quality—a systematic literature review with a meta-analysis of the past ten years. *Frontiers in psychology*, 12:781346, 2021.
- [5] Mohammadreza Hojat, Salvatore Mangione, Thomas J Nasca, Mitchell JM Cohen, Joseph S Gonnella, James B Erdmann, Jon Veloski, and Mike Magee. The jefferson scale of physician empathy: development and preliminary psychometric data. *Educational and psychological measurement*, 61(2):349–365, 2001.
- [6] Mohammadreza Hojat. *Empathy in Health Professions Education and Patient Care*. Springer International Publishing, 2016. doi: 10.1007/978-3-319-27625-0. URL <https://doi.org/10.1007/978-3-319-27625-0>.
- [7] Mohammadreza Hojat and Joseph S Gonnella. Eleven years of data on the jefferson scale of empathy-medical student version (jse-s): proxy norm data and tentative cutoff scores. *Medical Principles and Practice*, 24(4):344–350, 2015. doi: 10.1159/000381954.
- [8] Sylvia K Fields, Pamela Mahan, Paula Tillman, Jeffrey Harris, Kaye Maxwell, and Mohammadreza Hojat. Measuring empathy in health-care profession students using the jefferson scale of physician empathy: health provider–student version. *Journal of interprofessional care*, 25(4):287–293, 2011. doi: 10.3109/13561820.2011.566648.
- [9] Dorcas E Beaton, Claire Bombardier, Francis Guillemin, and Marcos Bosi Ferraz. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine*, 25(24):3186–3191, 2000.
- [10] Lidwine B Mokkink, Caroline B Terwee, Donald L Patrick, Jordi Alonso, Paul W Stratford, Dirk L Knol, Lex M Bouter, and Henrica CW de Vet. The cosmin study reached international consensus on taxonomy, terminology, and definitions of measurement properties for health-related patient-reported outcomes. *Journal of clinical epidemiology*, 63(7):737–745, 2010. doi: 10.1016/j.jclinepi.2010.02.006.
- [11] Renate LEP Reniers, Rhiannon Corcoran, Richard Drake, Nick M Shryane, and Birgit A Völlm. The qcae: A questionnaire of cognitive and affective empathy. *Journal of personality assessment*, 93(1):84–95, 2011. doi: 10.1080/00223891.2010.528484.
- [12] Nils Myszkowski, Eric Brunet-Gouet, Paul Roux, Léonore Robieux, Antoine Malézieux, Emilie Boujut, and Franck Zenasni. Is the questionnaire of cognitive and affective empathy measuring two or five dimensions? evidence in a french sample. *Psychiatry research*, 255:292–296, 2017. doi: 10.1016/J.PSYCHRES.2017.05.047.

- [13] Caroline B Terwee, Sandra DM Bot, Michael R de Boer, Daniëlle AWM van der Windt, Dirk L Knol, Joost Dekker, Lex M Bouter, and Henrica CW de Vet. Quality criteria were proposed for measurement properties of health status questionnaires. *Journal of clinical epidemiology*, 60(1):34–42, 2007. doi: 10.1016/j.jclinepi.2006.03.012.
- [14] Henrica CW De Vet, Caroline B Terwee, Lidwine B Mokkink, and Dirk L Knol. *Measurement in medicine: a practical guide*. Cambridge university press, 2011. doi: doi:10.1017/CBO9780511996214.
- [15] Davide Giavarina. Understanding bland altman analysis. *Biochemia medica*, 25(2):141–151, 2015. doi: 10.11613/BM.2015.015.
- [16] Richard Taylor. Interpretation of the correlation coefficient: a basic review. *Journal of diagnostic medical sonography*, 6(1):35–39, 1990. doi: 10.1177/875647939000600106.
- [17] Wan Nor Arifin. A web-based sample size calculator for reliability studies. *Education in medicine journal*, 10(3), 2018. doi: 10.21315/eimj2018.10.3.8.
- [18] Óscar Rodríguez-Nogueira, Raquel Leirós-Rodríguez, Arrate Pinto-Carral, María José Álvarez-Álvarez, Jaume Morera-Balaguer, and Antonio R Moreno-Poyato. The association between empathy and the physiotherapy–patient therapeutic alliance: A cross-sectional study. *Musculoskeletal Science and Practice*, 59:102557, 2022. doi: 10.1016/j.MSKSP.2022.102557.
- [19] Millie V Allen and Lisa C Roberts. Perceived acquisition, development and delivery of empathy in musculoskeletal physiotherapy encounters. *Journal of Communication in Healthcare*, 10(4):304–312, 2017. doi: 10.1080/17538068.2017.1366000.
- [20] Mohammadreza Hojat, Jennifer DeSantis, Stephen C Shannon, Luke H Mortensen, Mark R Speicher, Lynn Bragan, Marianna LaNoue, and Leonard H Calabrese. The jefferson scale of empathy: a nationwide study of measurement properties, underlying components, latent variable structure, and national norms in medical students. *Advances in Health Sciences Education*, 23:899–920, 2018. doi: 10.1007/S10459-018-9839-9.
- [21] Diane Thomson, Anne-Marie Hassenkamp, and Christina Mansbridge. The measurement of empathy in a clinical and a non-clinical setting: does empathy increase with clinical experience? *Physiotherapy*, 83(4):173–180, 1997. doi: 10.1016/S0031-9406(05)66074-9.
- [22] Cristina Petrucci, Elona Gaxhja, Carmen La Cerra, Valeria Caponnetto, Vittorio Masotta, Angelo Dante, and Loreto Lancia. Empathy levels in albanian health professional students: An explorative analysis using the jefferson scale of empathy. *SAGE Open*, 11(3): 21582440211032192, 2021. doi: 0.1177/21582440211032192.
- [23] Elsie Kim Hiok Lim, Gordon Jian Ting Loh, Ren Yong Ong, Rachel Ruizhen Tan, Clement Chee Kin Yan, Katherin Shilin Huang, Melissa Yi Ching Chan, and Meredith Tsz Ling Yeung. Finding echoes: An exploration of empathy among physiotherapists and physiotherapy students in singapore. *Proceedings of Singapore Healthcare*, 31:20101058211048581, 2022. doi: 10.1177/20101058211048581.
- [24] Kyung Hye Park, Dong-hee Kim, Seok Kyoung Kim, Young Hoon Yi, Jae Hoon Jeong, Jiun Chae, Jiyeon Hwang, and HyeRin Roh. The relationships between empathy, stress and social support among medical students. *International journal of medical education*, 6:103, 2015. doi: 10.5116/IJME.55E6.0D44.
- [25] Vânia Sofia Carvalho, Eloísa Guerrero, and Maria José Chambel. Emotional intelligence and health students’ well-being: A two-wave study with students of medicine, physiotherapy and nursing. *Nurse education today*, 63:35–42, 2018. doi: 10.1016/J.NEDT.2018.01.010.
- [26] Brett Williams, Ted Brown, Lisa McKenna, Malcolm J Boyle, Claire Palermo, Debra Nestel, Richard Brightwell, Louise McCall, and Verity Russo. Empathy levels among health professional students: a cross-sectional study at two universities in australia. *Advances in medical education and practice*, pages 107–113, 2014. doi: 10.2147/AMEP.S57569.
- [27] Julie Ann Starr, Mary Beth Holmes, Erin Riley, Brian McDonnell, Laura Driscoll, James Camarinos, Weronika Grabowska, and Allen G Harbaugh. A quantitative measurement of physical therapists’ empathy and exploration of the relationship with practice setting and work engagement. *Evaluation & the health professions*, 43(4):255–263, 2020. doi: 10.1177/0163278719864687.
- [28] Cristina Petrucci, Carmen La Cerra, Federica Aloisio, Paola Montanari, and Loreto Lancia. Empathy in health professional students: A comparative cross-sectional study. *Nurse education today*, 41:1–5, 2016. doi: 10.1016/J.NEDT.2016.03.022.
- [29] Christoph M Paulus and Saskia Meinken. The effectiveness of empathy training in health care: a meta-analysis of training content and methods. *International Journal of Medical Education*, 13:1, 2022. doi: 10.5116/IJME.61D4.4216.
- [30] Samantha A Batt-Rawden, Margaret S Chisolm, Blair Anton, and Tabor E Flickinger. Teaching empathy to medical students: an updated, systematic review. *Academic Medicine*, 88(8):1171–1177, 2013. doi: 10.1097/ACM.0B013E318299F3E3.