

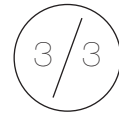
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Research



Experiences & Tools



**GIUNTI**  
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# Mediating role of self-handicapping behaviors between academic Psychological Capital and academic performance among university students

*Adnan Adil, Sadaf Ameer, Saba Ghayas, Sadia Niazi, Anam Yousaf*

*Department of Psychology, University of Sargodha, Sargodha, Pakistan*

*livespirit786@yahoo.com*

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• **ABSTRACT.** Questa ricerca ha investigato il ruolo mediatore dei comportamenti di self-handicapping tra il capitale psicologico (PsyCap) accademico e la performance accademica in un campione di studenti universitari (N = 300). Le componenti del PsyCap accademico sono state operazionalizzate tramite la Life Orientation Test-Academics Scale, la subscale di autoefficacia della Students' Approach to Learning Scale, la Academic Resilience Scale e la Academic Hope Scale, mentre i comportamenti di self-handicapping sono stati valutati attraverso la Self-Handicapping Scale-Revised. La media cumulativa dei voti degli studenti (CGPA) dei semestri precedenti ha fornito l'operazionalizzazione del loro rendimento accademico. Il modello di misurazione ha rivelato un buon adattamento ai dati e il modello strutturale ha evidenziato effetti diretti positivi del PsyCap accademico e l'effetto negativo dei comportamenti di self-handicapping sul rendimento accademico. I comportamenti di self-handicapping hanno mediato tra il PsyCap accademico e la CGPA: il PsyCap accademico ha migliorato la CGPA con la riduzione dei comportamenti di self-handicapping. È stata effettuata una riflessione sulle implicazioni dello studio e sulle raccomandazioni per la ricerca futura.

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• **SUMMARY.** *The present research explored the mediating role of self-handicapping behaviors between academic PsyCap and academic performance in a purposive sample of university undergraduates (N = 300). The components of academic PsyCap were operationalized through Life Orientation Test-Academics Scale, the self-efficacy subscale from Students' Approach to Learning Scale, Academic Resilience Scale and Academic Hope Scale, while self-handicapping behaviors were assessed through Self-Handicapping Scale-Revised. Student's cumulative grade point average (CGPAs) in the previous semesters provided the operationalization of their academic performance. The measurement model of the study revealed a good fit to the data and the structural model indicated positive direct effects of academic PsyCap and the negative effect of self-handicapping behaviors on academic performance. Self-handicapping behaviors mediated between academic PsyCap and CGPA such that academic PsyCap improved CGPA by reducing self-handicapping behaviors. Implications of the study and recommendations for future research have been reflected upon.*

**Keywords:** *Academic PsyCap, Self-handicapping behaviors, Academic performance*

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## INTRODUCTION

The positive performance impact of psychological capital in work and organizational settings has undoubtedly been established, yet the application of psychological capital for the improvement of academic performance needs to be empirically validated. Psychological capital plays a crucial role in improving the academic performance of students, and it is a very strong source for organizational excellence which is unfortunately still neglected in academic settings. Because of this negligence and lack of research on psychological capital within educational organizations, it is essential to continue the empirical investigation of psychological capital within academic settings. Therefore, Luthans and his colleagues' work (e.g., Luthans 2002; Youssef & Luthans, 2011) on psychological capital in organizational settings needs to be extended to the educational milieu, because students - the future employees need to foster psychological capital if they aspire to efficiently cope with the rapidly changing modern society and academic demands of study life. However, to the best of our knowledge, studies examining the associations among positive psychological capacities and academic achievement in university undergraduates are quite rare and it is even more scarce in Pakistan. Therefore, the present study aims at exploring and broadening the paradigm of POB (Positive Organizational Behavior; Luthans, 2002) to the realm of academic settings. The main objective of the study is to explore the dynamic interplay between PsyCap and the academic achievement of university students. Moreover, this study has adopted a balanced perspective of positive behavior by focusing on the human vulnerability of self-handicapping behavior in relation to PsyCap and academic achievement.

### Psychological Capital (PsyCap)

Luthans, Youssef and Avolio (2007) have conceived psychological capital as a developmental and positive state of an individual accompanied by confidence/self-efficacy (one's belief that one could be successful at challenging tasks by putting necessary effort), optimism (an individual makes positive attribution that he/she will be successful in future), hope (an individual continues effort to achieve the goal despite difficulty or discouragement and change the direction to be successful); and resilience (when the individual is surrounded by problems then withstanding and

even rebounding back for the accomplishment of success). Thus, PsyCap is a superordinate construct that is unique, measurable, developable, and can be capitalized upon for improving task performance.

The focal point of psychological capital is an individual's personal strengths and positive qualities. It is believed that it leads to a better and improved performance of the individual (Luthans, Youssef et al., 2007). PsyCap may motivate individuals intrinsically (Adil, Ameer & Ghayas, 2019; Siu, Bakker & Jiang, 2014) and according to the self-determination theory (Deci & Ryan, 2012), intrinsic motivation has a greater influence on performance related to goal achievement rather than any other external pressure. Students who have psychological capital know their goals because of which they are intrinsically motivated. They work with motivation and may experience a state of flow in doing their tasks resulting in better performance (Adil, Ameer & Ghayas, 2020).

#### – *Psychological capital and academic performance.*

As suggested by the educational scholar, when the psychological resources are used in the educational setting, they result in positive behavior (Pajares, 2001). The scholars have found that hope, optimism, self-efficacy, and resiliency are the positive personal resources that lead to improved academic performance (Bandura, 1997; Masten & Reed, 2002; Seligman, 2006; Snyder, 2005). The role of personal resources is well documented in the job demands-resources model (JD-R model; Bakker & Demerouti, 2008) that has traditionally been used to explain how job demands job/personal resources may trigger the processes of burnout and engagement. The former leads to poor work outcomes whereas the latter results in improved job performance and desirable work attitudes.

Ngusci et al. (2020) adapted the JD-R model to the academic setting and they noted several parallels between the academic activities and activities in work/organizational settings. Ngusci et al. conceived students' well-being and efficiency as the result of two conditions: study demands (e.g., studying for tests, starting new projects, carrying out training, completing assignments, attending classes, managing the study load) and study resources (meta-competencies, networking, social feedback, relationships with professors). Specifically, social and personal resources (e.g., proactivity, networking, PsyCap), as well as technical and structural ones (e.g., technical skills and knowledge), allow handling the demands. Taken together,

demands and resources trigger two opposite processes: academic burnout and study engagement, respectively. Burnout may lead to poor academic performance whereas engagement may lead to improved academic achievement. The adaptation of the JD-R model to the educational and academic setting by Ngusci et al. (2020) warrants more research to explore the influence of PsyCap as a personal resource on academic outcomes since the majority of the research on PsyCap has been undertaken in organizational settings.

Past studies have shown that psychological capital can enhance academic performance. In a sample of university students of management studies, Luthans, Avolio, Avey and Norman (2007) observed that students who were rich in PsyCap were more likely to secure higher cumulative grade point averages (CGPAs; from now on this acronym will be used). Another study by Luthans, Luthans and Jensen (2012) found that psychological capital positively predicted CGPAs of university students of business studies and PsyCap training might foster the growth and success of the business students. Similarly, Adil et al. (2020) found that academic PsyCap was a positive predictor of CGPAs of Pakistani university undergraduate students.

Vanno, Kaemkate and Wongwanich (2014) carried out research on exploring the influence of positive psychological capital on student-related outcomes. Providing experiential evidence on the relationship between academic performances, perceived group psychological capital, and individual psychological capital was the central objective of the study. The sample of the study was 418 Thai undergraduate students. The findings of the study indicated that academic PsyCap positively predicted academic performance and individual level of PsyCap positively mediated between group psychological capital and academic achievement.

## Self-handicapping

Researchers have defined self-handicapping in a variety of ways, however, most of the researchers agree on the point that it may involve constructing barriers to successful performance on those tasks which have great valence for the individuals (e.g., Covington, 1992; Rhodewalt, 1994). These types of obstacles in performance could be a corollary to inaction (failing to study for the exam) or action (e.g., getting

drunk the night before an exam). Usually, self-handicapping behaviors take place before or simultaneously with the achievement task (Núñez, Freire, del Mar Ferradás, Valle & Xu, 2021).

According to Adil et al. (2020), any situation that may involve an ability testing process may foster self-handicapping behavior. Educational settings constitute excellent real-world milieus for observing self-handicapping behaviors because students are continuously exposed to such situations and tasks which not only test their competence and ability but also make this information public. Moreover, students' performance on such tasks has a tremendous influence on their academic outcomes such as their grading, CGPAs, completion of the degree, prospects of higher studies, and job. According to Núñez et al. (2021), self-handicapping behavior allows students to keep their self-worth intact in the eyes of others because the cause of the poor performance would be the handicap. In addition, their projected self-image in the eyes of their teachers and peers is at stake, which they need to preserve. This preservation of projected self-image is the real objective of the self-handicappers. Finally, educational milieus provide an opportunity to study not only the self-handicapping dispositions but also the probable circumstantial factors that may foster self-handicapping behavior.

Self-handicapping can be effective in the short term, as it allows the student to preserve their self-worth in their own eyes and their social setting (Török, Szabó & Tóth, 2018). However, using it repeatedly usually leads to notable academic harm -e.g., poor performance, dropping out (Akar, Dogan & Üstüner, 2018; Clarke & MacCann, 2016), which ends up undermining the students' feelings of self-worth (Zuckerman & Tsai, 2005).

– *Self-handicapping and academic performance.* Results of field research on the association between academic performance and self-handicapping suggest mixed findings. Some studies found non-significant results (Rhodewalt & Hill, 1995) whereas others found moderately negative (Schwinger & Stiensmeier-Pelster, 2012) and substantial negative relationships (Midgley & Urdan, 1995, 2001). This huge variation in findings has precluded scholars from generalization regarding the average size of the association between self-handicapping and achievement; which, in turn, had made it hard to derive any implications of self-handicapping in educational settings.

Some researchers have demonstrated that self-handicapping behavior arises from a rancorous circle whereby handicapping results in lower achievement, which in turn further exacerbates the need for handicapping (Zuckerman, Kieffer & Knee, 1998). Self-handicapping, for instance, has been associated with negative and ineffective coping mechanisms, heightened levels of withdrawal, and poorer study routines. Furthermore, self-handicapping had demonstrated a reciprocal relationship with poor adjustment over time, which furnished empirical evidence for the vicious cycle of self-handicapping (Zuckerman et al., 1998).

Numerous research studies suggest that self-handicapping may negatively influence important academic outcomes and processes such as motivation and performance (Martin, Marsh & Debus, 2001; Zuckerman et al., 1998). Since self-handicapping behavior may lead to reduced effort or simply abounding the effort for a particular task, therefore, it is quite likely that the self-handicappers will demonstrate relatively poor performance on the given tasks. Beck, Koons and Milgrim (2000) observed that students with a high degree of self-handicapping behaviors were likely to procrastinate more and study less, which led to poor academic performance and poor overall course grades. High self-handicappers reduce effort and express more stress before the exam, and their exam performance is worse than the low self-handicappers (McCrea & Hirt, 2001). Self-handicapping was found as a negative predictor of both exam performance and GPA (Elliot & Church, 2003). Self-handicappers reported a low level of self-esteem, school adjustment and achievement, high level of norm-breaking behavior, and poor teacher relations (Maatta, Stattin & Nurmi, 2002), and they are more prone to cheating (Ozgunor, 2008). Yildirim and Demir (2020) found test anxiety as a positive predictor of self-handicapping in a sample of Turkish undergraduate students. According to Núñez et al. (2021), self-handicapping is a motivational strategy that partially explains students' poor behavioral engagement with homework in the absence of parental support.

- *Self-handicapping and PsyCap.* Self-efficacy is an important component of PsyCap and self-efficacious students are less likely to be indulged in self-handicapping behaviors. A meta-analytic study by Schwinger, Wirthwein, Lemmer and Steinmayr (2014) integrated the findings of 36 studies ( $N = 25,550$ ) involving 49 independent

effect sizes on academic performance, self-esteem, self-handicapping, and goal orientation. Findings showed that self-handicapping was negatively associated with self-esteem and different educational outcomes (academic achievement). Soltani, Jamali, Khojastehnam and Dargahi (2016) found that academic self-efficacy and academic resilience (the two components of PsyCap) negatively predicted academic procrastination. Moreover, Adil et al. (2020) found that university undergraduates who were rich in academic PsyCap experienced a low degree of self-handicapping behavior, which in turn led to improved academic performance.

Given the aforementioned literature, the present study postulated the following hypotheses:

1. Academic PsyCap will predict CGPA positively;
2. Academic PsyCap will predict self-handicapping behavior negatively;
3. Self-handicapping behaviors will predict CGPA negatively;
4. Self-handicapping behaviors will mediate between academic PsyCap and CGPA such that PsyCap will improve the CGPA by reducing self-handicapping behaviors.

## METHOD

### Participants

The sample of the present study was drawn through purposive sampling and was comprised of 300 students of the University of Sargodha. The students of the 5-8<sup>th</sup> semesters of BS Honor (4-year program) and MSc (2-year program) were included in the study. Both boys ( $n = 150$ ) and girls ( $n = 150$ ) from regular programs ( $n = 150$ ) and self-support programs ( $n = 150$ ) were included in the sample. The mean age of students was 22.13 years ( $SD = 2.99$  years).

First of all, the official letter of permission for data collection was obtained from the Department of Psychology, University of Sargodha. Most of the participants were contacted in the classrooms while others were contacted in the canteens, library, and on the sports grounds. To collect data from them, rapport was built so that they might feel comfortable and cooperate to respond honestly. The nature, objectives, and the salience of the present study were explained to the participants and while taking their informed consent, they were assured of the confidentiality of

their responses on the instruments. Afterward, demographic information was taken. Then participants were given instructions regarding filling the questionnaire. They were assisted wherever they needed help in the questionnaire to give the appropriate response. On average 45 minutes were taken by the participants to complete the questionnaire. In the end, participants were humbly thanked for their cooperation and time.

## Instruments

- *Academic PsyCap Measure.* The components of academic PsyCap were measured through the Perceived self-efficacy subscale from *Student Approaches to Learning Scale*, *Life Orientation Test-Academics Scale*, *Academic Hope Scale*, and *Academic Resilience Scale*. The scores on these four scales were summated after reversely coding the negative items. This summated score provided a measure of academic PsyCap. The same summated scale had already been used as a reliable measure of academic PsyCap (see Adil et al., 2019, 2020). The whole measure comprised 25 items with a uniform 5-point Likert type agreement scale. The alpha reliability coefficient of the scale in the present study was .80. The details of the constituent scales of academic PsyCap measure are as follows:
  - *Perceived self-efficacy subscale from Student Approaches to Learning Scale.* The academic self-efficacy component of academic PsyCap was measured through a 4-item subscale of Perceived self-efficacy from the *Students' Approaches to Learning Scale* (Marsh, Hau, Artelt, Baumert & Peschar, 2006). There was no reverse-scored item on the scale. The authors reported a satisfactory level of internal consistency for this scale (Cronbach's  $\alpha = .87$ ). "I am certain I can master the skills being taught" is a sample item of this scale.
  - *Life Orientation Test-Academics Scale.* The academic optimism component of academic PsyCap was measured through the *Life Orientation Test-Academics Scale* (Chang, Bodem, Sanna & Fabian, 2011). The scale was comprised of six items. Item 2, 4, and 5 were inversely phrased, so they were reverse coded. According to Chang et al. (2011), the scale demonstrated a satisfactory level of internal consistency (Cronbach's  $\alpha = .77$ ). "I'm always optimistic about my academic future" is a sample item on this scale.
  - *Academic Hope Scale.* Developed by Shorey and Snyder (2004), the *Academic Hope Scale* comprising of nine items

was used to measure the academic hope component of academic PsyCap. The scale had no reverse-coded items. The authors of the scales reported a Cronbach's  $\alpha = .79$  for this scale. "I can think of many ways to make good grades" is sample item on this scale.

- *Academic Resilience Scale.* Academic resilience was assessed through the *Academic Resilience Scale* developed by Martin and Marsh (2006). The scale was comprised of six items. Martin and Marsh reported acceptable fit values for CFA of the scale (CFI = .97; NNFI = .97). The authors of the scale also established an excellent standard of internal consistency (Cronbach's  $\alpha = .89$ ). There were no reverse-scored items on the scale. "I am good at bouncing back from a poor mark in my academic work" is a sample item on this scale.
- *Self-handicapping Scale-Revised.* *Self-handicapping Scale-Revised* (Urdu & Midgley, 2001) was used to measure academic self-handicapping in the sample of the present study. The scale comprises of 6 items with 5-point Likert type response options (1 = "Definitely false of me" and 5 = "Definitely true of me"). None of the items was reverse coded. The authors' reported alpha coefficient of reliability was .87. All items were summed up to yield a composite score on self-handicapping. "Some students put off doing their academic work until the last minute so that if they do not do well on their work, they can say that is the reason. How true is this of you?" is a sample item on this scale.
- *Academic performance.* Academic performance was measured through a single item open-ended question that asked the respondents to report their CGPA of their previous semester. The reported CGPAs of participants were also confirmed by the office of the departmental controller of examinations.

## Analysis

The obtained data were subjected to statistical analyses through IBM SPSS V-24 and IBM Amos V-23. An examination of the missing value revealed no missing values in the data. Furthermore, the data were normally distributed and no outliers were identified. Descriptive statistics, internal consistency of the scales, and interscale correlations were computed through IBM SPSS. The proposed hypotheses and the mediational model of the present study was tested through path analysis in IBM Amos employing maximum

likelihood (ML) estimation procedures with bias-corrected ML confidence intervals computed from 2000 bootstrap samples. The path analysis was based on covariance rather than correlation matrices.

## RESULTS

The data were subjected to statistical analyses. The descriptive statistics, correlation matrix, and alpha coefficients were computed through SPSS whereas the proposed hypotheses were tested through Amos.

Table 1 displays means, standard deviations, ranges, skewness, and alpha coefficients for each measurement instrument utilized in the current research. From standard deviation scores, it can be discerned that mean scores were representatives of their respective distribution and minimal differences between actual and potential ranges suggest that the range of responses was not restricted. All the instruments demonstrated high levels of internal consistency, which suggested that the measures used in the present study were reliable.

The correlation matrix in Table 2 shows that all variables were correlated with one another in the expected directions.

**Table 1** – Mean, standard deviations, and alpha reliability coefficients of the scales (N = 300)

Scales	<i>M</i>	<i>SD</i>	Range		<i>Sk</i> <sup>a</sup>	<i>α</i>
			Actual	Potential		
CGPA	2.85	.44	1.96-3.96	0-4	.12	–
Self-handicapping Scale	11.09	4.90	0-20	0-24	–.35	.78
Academic PsyCap Scale	64.25	9.81	21-82	0-100	–.62	.80
Age	21.70	1.16	19-26	–	.20	–

*Legenda.* <sup>a</sup> = Standard error of skewness = .14

**Table 2** – Intercorrelations of the variables of the present study (N = 300)

Variables	1	2	3	4
1. Academic PsyCap	–	–.13*	.30***	–.08
2. Self-handicapping behavior	–	–	–.42***	.08
3. CGPA	–	–	–	.12*
4. Age	–	–	–	–

\* $p < .05$ ; \*\*\* $p < .001$ .



Table 3 shows the standardized coefficients of direct and indirect paths of the structural model of the present study. The model demonstrates a good fit to the data ( $\chi^2 = 5.39$ ,  $df = 2$ ,  $p = .067$ , CFI = .96, NFI = .94, RMSEA = .075). Academic PsyCap demonstrates the positive direct effect on CGPA and the negative direct effect on self-handicapping

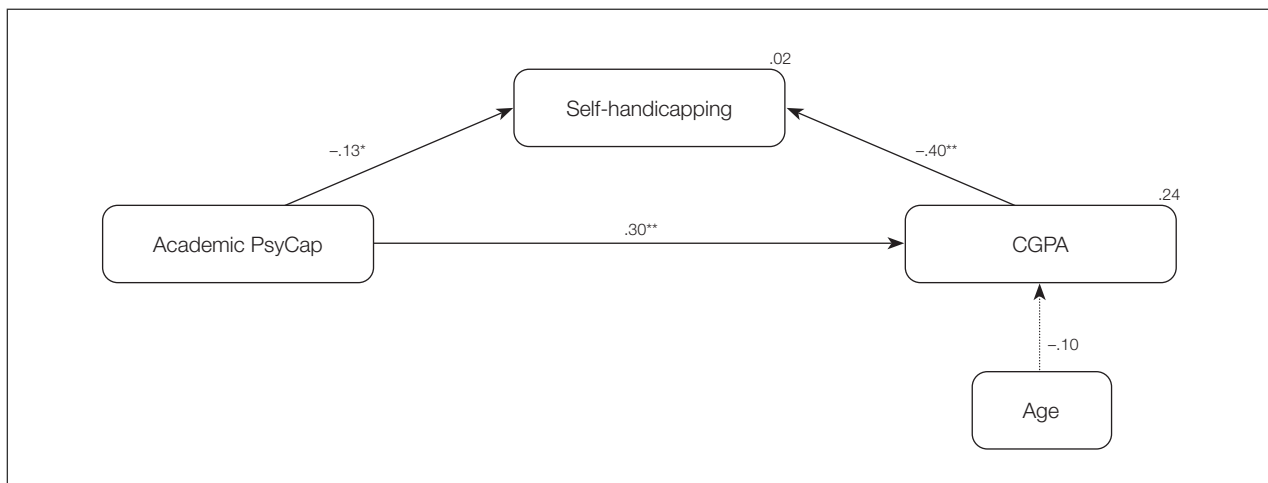
behavior. Self-handicapping has negative direct effects on CGPA. Finally, academic PsyCap demonstrated positive indirect effects on CGPA through self-handicapping behaviors.

Path model of the present research is represented in Figure 1.

**Table 3** – Standardized path coefficients of direct and indirect effects (N = 300)

Paths	$\beta$	95% CI		<i>p</i>
		LL	UL	
Academic PsyCap → Self-handicapping behavior	-.13	-.22	-.01	.048
Academic PsyCap → CGPA	.30	.21	.40	.007
Self-handicapping behavior → CGPA	-.40	-.49	-.30	.007
Academic PsyCap → Self-handicapping behavior → CGPA	.05	.02	.08	.022
Age → CGPA	-.01	-.02	.03	.87

**Figure 1** – Path model of the present research



*Note.* The values of standardized path coefficients are given on each path. Solid paths show significant whereas dashed path shows non-significant direct effects. The values of  $R^2$  are given on the upper right corners of the endogenous variables. Age was taken as the control variable.

## DISCUSSION

The findings of the present study provided empirical support for all the hypothesized relationships. Our first hypothesis was supported as psychological capital emerged as the positive precursor of academic achievement. The job demands-resources model (JD-R model, Bakker & Demerouti, 2008) may offer a pertinent explanation for this finding of the present study. The JD-R model suggests that in educational settings, personal resources may refer to those attributes of an individual that may turn study demands into challenges, may reduce the aversive influences of study demands, or may assist the students in meeting their study demands. PsyCap, as a personal resource, may revive individuals by facilitates their speedy recovery from past failures, which may enable them to be devoted, be more focused, and be more immersed in their tasks (Siu et al., 2014). PsyCap may enable university students to meet their study demands because PsyCap involves individuals' positive agentic resources, which facilitate them in their striving for achievements and development (Sweetman & Luthans, 2010).

A plausible explanation for the positive association between academic achievement and PsyCap may delineate academic PsyCap as positively feedbacking on students' academic performance. Stajkovic (2006) noted that a common confidence core runs across all the constituent elements of PsyCap (resilience, hope, self-efficacy, and optimism). Therefore, students rich in PsyCap may have greater self-confidence that may lead to mastery experiences resulting in a further increase in self-efficacy and other constituents of psychological capital. Relevant literature supports this line of reasoning because various studies demonstrated that PsyCap had a positive influence on various desired student outcomes such as academic achievement (Luthans et al., 2012; Malone, 2010) and creativity (Tsai et al., 2012).

Findings of the present study indicated that self-handicapping not only predicted CGPA negatively, it also mediated between academic PsyCap and CGPA. These results provided support to our third and fourth hypotheses. Findings from numerous studies converge on the conclusion that academic self-handicapping is negatively related to such salient educational outcomes and processes as academic achievement and motivation (e.g., Martin et al., 2001; Zuckerman et al., 1998). Findings of various studies have generally indicated that people who indulge in self-handicapping strategies are more likely to

have poor self-esteem, have less clear and poorly organized academic goals, and come up with low levels of academic achievement (Hendrix & Hirt, 2009; Schwinger et al., 2014). In the educational milieu, self-handicapping behaviors are usually depicted by procrastination, lack of focus on the lecture, incomplete projects and assignments, no reading of the course contents, poor time management for study hours, being indifferent to the attendance in the class, and insufficient preparation for examinations (Smith, Hardy & Arkin, 2009). According to the literature, these strategies may negatively influence learning and threaten students' performance (Gadbois & Sturgeon, 2011; Schwinger et al., 2014).

Self-handicapping and self-regulation cycle (Rhodewalt & Tragakis, 2002; Rhodewalt & Vohs, 2005) provides a theoretical model for explaining the association among academic self-handicapping, academic PsyCap, and achievement. This model suggests that distal drives such as unclear self-conceptions about ability or low levels of self-efficacy (a core component of academic PsyCap) may lead to poor performance expectations in the upcoming examinations that may result in a pessimistic approach to the examinations. This pessimistic approach may serve as proximal predictors of using self-handicapping strategies for protecting the self-concept. This means that academic PsyCap may reduce the chances of one's being indulged in self-handicapping behaviors.

Rhodewalt and Tragakis (2002) found that instead of being concerned with the actual performance, self-handicappers are more apprehensive about their self-esteem. Owing to this imbalanced focus, people may choose handicaps, which may serve to protect their self-esteem but invariably lead to poor performance. The poor performance may have a cyclic influence on one's self-conceptions of competence i.e., self-efficacy, and owing to this feedback, a fresh cycle of a vulnerable self-concept, self-handicapping as a means to self-protection, and resultant poor performance may ensue (Zuckerman et al., 1998).

## CONCLUSION AND IMPLICATIONS

The findings of the present study suggested some salient implications for both theory expansion and practice of educational psychology. Results of the present study suggested academic PsyCap as an invaluable source of boosting

academic performance by reducing self-handicapping behaviors. Owing to the malleable nature of psychological capital, it can be cultivated and fostered in our students. Our findings indicated academic PsyCap as a very powerful predictor of students' CGPA; intervention programs for boosting students' academic achievement must incorporate PsyCap training to develop this valuable personal resource of the students. Specific micro-level programs for developing PsyCap in organizational settings have been designed by Luthans, Avey, Avolio, Norman and Combs (2006). This program may be adapted to educational settings.

The results of the present study also suggested that self-handicapping behaviors constitute a debilitating source of poor academic outcomes. Such behaviors may keep students' self-evaluations intact but may deprive them to take on challenges and to thrive in the face of stressful events. Consequently, a vicious circle ensues and self-handicapped students may habitually start avoiding demanding circumstances, owing to which they might have been deprived of many opportunities. On the pragmatic side, these results suggest that students should be made cognizant of their self-handicapping behaviors and they should be trained in overcoming the temptations of self-handicapping behaviors.

## Limitations and recommendations

The present study has its share of limitations, and the following section is meant to highlight its salient limitations.

1. This study has utilized a cross-sectional design. Therefore, the cause-and-effect relationship cannot be inferred about the variables in regression models. Future studies should employ a longitudinal design so that causal interpretations of the findings may be made more confidently. However, it should be noted that the causal ordering of various constructs in the present study has been made in accordance with pertinent theory and relevant research support.
2. All the variables of the current study were measured through self-report instruments, which may result in an

inflated relationship. Future research may employ a multi-method approach.

3. The sample of the current study was only limited to undergraduate students of the University of Sargodha, which is certainly not representative of the whole university student population of Pakistan. This might have compromised the generalization potential of the present study. Future studies must recruit a representative sample of Pakistani university students, which may not only help enhance the external validity of the findings but also may yield insight into the dynamics by which personal resources and their academic outcomes may vary across universities.
4. The survey research design does not provide any controlling method for managing the extraneous variables, which constituted another limitation of the present study. The probable role of temporal and situational factors (for example, financial issues, unstable home, and familial relationships, interpersonal conflicts, periods of examinations, etc.) participants were exposed to at the time of data collection might have influenced the findings of the current research.
5. The constructs of the present study should be examined at their facet levels in future studies. Various dimensions of academic PsyCap might probably have been related to other constructs in different fashions than their corresponding super-ordinate construct of PsyCap. This may help elucidate the fine subtleties of relationships among constructs of the present research.
6. Finally, there are several avenues for future research related to the results of the current investigation. As academic PsyCap turned out to be an important predictor of academic performance, future research should also explore the potential role of other constructs of positive psychology concerning academic outcomes. The positive character strength of wisdom and creativity holds promise for positive influence on academic outcomes such as study engagement and academic performance. Furthermore, the incremental validity of academic PsyCap against intelligence (IQ) score should be established in future studies.

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# The association of HRM practices with organizational citizenship behaviors: The mediating role of work engagement, perceived organizational support and leader-member exchange

Amelia Manuti<sup>1</sup>, Alessandro Lo Presti<sup>2</sup>, Maria Luisa Giancaspro<sup>1</sup>

<sup>1</sup> Dipartimento di Scienze della Formazione, Psicologia, Comunicazione, Università degli Studi "Aldo Moro", Bari, Italy

<sup>2</sup> Dipartimento di Psicologia, Università degli Studi della Campania Luigi Vanvitelli, Caserta, Italy

amelia.manuti@uniba.it  
mlgiancaspro@gmail.com  
alessandro.lopresti@unicampania.it

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✎ **ABSTRACT.** Il principale obiettivo del presente studio è stato quello di esaminare se ed in che misura una percezione positiva da parte dei dipendenti delle pratiche di gestione delle risorse umane realizzate dall'organizzazione potesse influenzare i comportamenti di cittadinanza organizzativa, attraverso la mediazione del work engagement, della leader-member exchange e del supporto organizzativo percepito. Lo studio è stato condotto nel contesto sanitario e ha coinvolto un gruppo di 407 dipendenti che hanno compilato un questionario comprendente informazioni socio-professionali e misure specifiche relative alle variabili indagate. In sintonia con un approccio people-based, i risultati confermano la relazione positiva tra percezione delle pratiche HR e comportamenti di cittadinanza.

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✎ **SUMMARY.** Some of the most recent contributions on HRM practices have highlighted how employees' perceptions about people management could be proximal predictors of positive attitudes and behaviors. The main aim of the present contribution was to examine if and to what extent a positive employees' HRM perception could be related to organizational citizenship behaviors, being work engagement, perceived organizational support, and leader-member exchange mediators of this association. The study was carried out in a healthcare private organization located in Southern Italy. 407 employees filled in a questionnaire encompassing socio-professional information and measures of HRM Perception, perceived organizational support, work engagement, leader member exchange, and organizational citizenship behavior. Results confirmed the crucial role played by employees' perceptions of HRM practices for organizational citizenship behaviors, supporting the people-based view of organizations.

**Keywords:** Organizational behavior, Work engagement, Perceived organizational support, Leader-member exchange

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## INTRODUCTION

In the last decades, empirical evidence confirmed the positive impact of a people-based approach in Human Resource Management (HRM) on organizational performance (Siddique, Procter & Gittel, 2019; Wang, Kim, Rafferty & Sanders, 2020).

Such an approach to people management, also known as “soft approach” (Beardwell, Holden & Claydon, 2004), “high-commitment orientation” (Wood & de Menezes, 1998) or “strategic approach” (Noe, Hollenbeck, Gerhart & Wright, 2006), postulates that supportive HRM systems might increase employee motivation, ultimately impacting on productivity and performance (Peccei, Van de Voorde & Van Veldhoven, 2013).

Accordingly, consistent research also showed that employees’ motivation resulting from a positive HRM practices’ perception might impact on other crucial organizational behaviors, such as organizational citizenship behaviors, work engagement, leader-member exchange and perceived organizational support (Posthuma, Campion, Masimova & Campion, 2013).

Therefore, it is through a properly designed management of HR systems that the organization could reinforce employees’ motivation and engagement, thus impacting on positive organizational behavior. Moreover, it is through supportive HRM practices that the management could develop knowledge and manage learning, some of the most distinctive resources in times of change and global competition.

In fact, a vast body of research examined the relationships between HRM practices and other significant organizational variables. Some focused on the direct relationship between HRM practices and outcomes (Albrecht, Bakker, Gruman, Macey & Saks, 2015; Messersmith, Patel, Lepak & Gould-Williams, 2011) and some other considered the variables that might mediate this relationship at an individual, group and organizational level (Boon & Kalshoven, 2014; Boxall, Guthrie & Paauwe, 2016; Ertürk, 2014; Gavino, Wayne & Erdogan, 2012; Kilroy, Flood, Bosak & Chênevert, 2017; Li, Sanders & Frenkel, 2012; Mayes, Finney, Johnson, Shen & Yi, 2017).

In line with this evidence, the present study aimed to contribute to the discussion about the role played by mediators by proposing an extension of the study by Alfes, Shantz, Truss and Soane (2013) addressed to test a comprehensive model framing the relationship between HRM practices and organizational performance in the

Italian context. Differently from the study cited above that involved employees in a service sector organization, the present research was addressed to extend the model to another peculiar working context, namely the health care sector, considered that recently a growing body of scientific evidences showed increasing interest in understanding how HR practices could be used to impact on individual and organizational performance in health care organizations (Baluch, Salge & Piening, 2013; Rodwell & Teo, 2008; Veld, Paauwe & Boselie, 2010). In 2013, *The International Journal of Human Resource Management* devoted a special issue - “An international perspective on Human Resource Management and performance in the health care sector: Toward a research agenda” - edited by Batram and Dowling to this very topic. The papers presented showed a lively debate about this topic underlining the role played by HRM practices on some significant individual and organizational attitudes and behaviors such as employees’ engagement, job satisfaction, extra-role behaviors, burnout and civility toward patients.

In view of the above, the present study aimed to contribute to this debate by examining if and to what extent the model proposed by Alfes, Shantz et al. (2013) could explain the association between employees’ perception of HRM practices in the health care sector with employees’ organizational citizenship behaviors in light with some potential mediators that might intervene at an individual level (work engagement), at a group level (leader-member exchange) and at an organizational level (perceived organizational support).

Evidence from this study could potentially be useful to plan and to improve interventions at the individual (i.e., enhancing work engagement and reducing employees’ risk of burnout) and at the organizational level (i.e., reducing turnover and making teamwork and collaboration more effective), if the above-mentioned mediators proved to be significant ones.

## LITERATURE REVIEW

### HRM practices perception and employees’ organizational citizenship behaviors

The theoretical speculations drawn above underline that undoubtedly supportive HRM practices are related to positive individual employee attitudes and behaviors (Gould-

Williams & Davies, 2005; Kehoe & Wright, 2013).

This strand of research basically draws on social exchange theory, maintaining that the norm of reciprocity regulates interpersonal relationships (Cropanzano & Mitchell, 2005; Eisenberger, Huntington, Hutchison & Sowa, 1986; Rhoades & Eisenberger, 2002). With special reference to the working contexts, according to social exchange theory, by receiving economic and/or socio-emotional rewards and benefits, employees feel that the organization is recognizing their contribution. Consequently, to reciprocate this acknowledgement, employees tend to develop positive attitudes and/or performing positive behaviors.

Prior research largely confirmed this evidence: employees having positive perceptions about HRM practices tend to exhibit more frequent extra-role behaviors (Anand, Vidyarthi, Liden & Rousseau, 2010), are more engaged (Saks, 2006), show lower levels of turnover intentions (Dysvik & Kuvaas, 2010), and show higher affective commitment (Sanders, Dorenbosch & de Reuver, 2008).

Accordingly, for organizations, promoting supportive HRM practices means investing in employees' positive perceptions about organizational support (Allen, Shore & Griffeth, 2003), that ultimately may result in the enactment of positive organizational behaviors.

Examples of supportive HRM practices could be, for instance, training and development opportunities and constructive feedbacks and acknowledgements about performance. Similarly, fair rewards and job security are also important aspects that might signal that the organization cares about employees' satisfaction, wellbeing, motivation and is willing to invest on them. Finally, participation and involvement in decision-making could represent important feedbacks about the appreciation of employees' contributions, underlining at the same time the effort accomplished by the organization to build a positive relationship with its employees.

On the other hand, there are different kind of positive organizational behaviors that employees could perform to show the organization that they appreciate these efforts. organizational citizenship behaviors (OCB) are among the most prominent and examined ones. Accordingly, this concept concretely refers to all those actions or behaviors that employees perform beyond their formal role requirements (Podsakoff, MacKenzie, Paine & Bachrach, 2000). These are generally considered an individual positive outcome of enlightened organizational management practices as well

as a positive antecedent of individual and organizational-level outcomes, such as for instance managers' performance evaluations and promotion decisions or turnover intentions (Podsakoff, Whiting, Podsakoff & Blume, 2009). Accordingly, several empirical studies showed that employees' perceptions of HRM practices could positively influence OCB. For example, Alfes, Shantz et al. (2013) showed that there is a positive relationship between HRM practices and OCB which is mediated by employee engagement and that this relationship is enhanced if perceived organizational support, trust and leader-member-exchange were higher. Further confirmations came from a study by Newman, Miao, Hoffman & Zhu (2016), showing that HRM practices are directly linked to OCB. OCB was also proven to significantly mediate the relationship between perceived human resource management practices (i.e., retention-oriented compensation and formal training) and employees' intention to leave their job (Lam, Chen & Takeuchi, 2009). Proven that HRM and OCB are positively associated, evidence is still sparse about the potential intermediate variables that connect them. Based on this premise, as we mentioned above, it appears compelling to identify these mediators and, moreover, contrast them. The following section focuses on this very aspect.

## The mediating role of work engagement, perceived organizational support, leader-member exchange

Given the association between HRM practices and the individual and organizational outcomes described above, most recent empirical contributions focused on the examination of those mechanisms through which HRM practices are linked to performance. As a result, these studies have advanced a few employee attitudes as potential mediators in the causal chain.

Particularly, HRM practices have been linked to job satisfaction, affective and continuance commitment, and perceptions of procedural and interactional justice (Takeuchi & Takeuchi, 2013). More recently, employee engagement, perceived organizational support and leader-member exchange have been proven to be significant mediators of the relationship between HRM practices and organizational behaviors (Alfes, Shantz et al., 2013).

Yet, work engagement is defined as "a positive, fulfilling, work-related state of mind that is characterized by vigor,



dedication, and absorption” (Schaufeli, Salanova, Gonzàles-Roma & Bakker, 2002, p. 74). It refers to the extent to which individuals invest themselves in their work roles, showing energy and initiative in their work. In view of the above, work engagement was proved to be a significant antecedent of task-oriented and citizenship behaviors (Babcock-Roberson & Strickland, 2010).

In a similar vein, empirical evidence also showed that high levels of engagement are related to positive HRM practices (Alfes, Shantz et al., 2013). Indeed, it could be argued that if people experience positive relationships within the organizational context, if they feel they are valued and appreciated by the management, they would likely engage in their work investing more time and energy (Macey & Schneider, 2008).

Basing on such premises, it was expected that the link between perceived HRM practices and employee behavior could be indirect and mediated by employees’ work engagement. Thus:

*Hypothesis 1: Work engagement will mediate the relationship between perceived HRM practices and organizational citizenship behaviors.*

Very often, the perception of HR practices is associated with the organizational support perceived by employees. With the acronym POS scholars refer to employees’ perceptions about “the extent to which their organization values their contribution and cares about their well-being” (Eisenberger et al., 1986, p. 501). These perceptions are strictly related to the affordances made available by the organization and above all by the motivations that according to the employees stay behind these affordances. A positive representation about these motivations will probably encourage employees to pay back the organization by performing extra-role behaviors and by decreasing their turnover intentions (Dawley, Houghton & Bucklew, 2010).

In light with these evidences, in their meta-analysis Kurtessis and colleagues (2015) discussed findings from 558 studies and concluded that several organizational factors could be antecedents of POS (e.g. leadership, employee-organization context, human resource practices, and working conditions) as well as POS could determine many different behavioral consequences (e.g., employee’s orientation toward the organization and work, employee performance, and well-being). Therefore, considering these conclusions within the wider framework of the social exchange theory, the present study argued that employees who tend to perceive a stronger

support by their organization would consequently feel more obliged to the organization, showing also higher levels of OCB. In view of the above, it could be postulated that:

*Hypothesis 2: The positive association between HRM practices and organizational citizenship behaviors will mediate by perceived organizational support.*

Finally, a third variable which was showed to be a key factor mediating HRM practices perceptions and organizational behaviors is employees’ perception about the relationship with their leaders (Leader-Member Exchange, LMX). The quality of this dyadic relationship, mostly based on the exchange of material and relational resources by both parties, could influence followers’ perceptions of trust and obligation toward their leaders. If the relationship is perceived to be a positive and motivating one, followers would more probably feel encouraged to perform extra-role behaviors. Accordingly, abundant research in the field showed that the quality of the LMX relationship is related to a range of individual and organizational outcomes, including extra-role behaviors (Venkataraman, Green & Schleicher, 2010). Therefore, leaders and supervisors were proven to have a great responsibility in motivating and engaging employees, in creating the conditions to encourage people to thrive and to go behind role prescriptions. In view of the above, it could be argued that engaged employees who have developed a positive LMX relationship with their supervisors will reciprocate by performing citizenship behaviors. Hence:

*Hypothesis 3: The positive association between employee engagement and organizational citizenship behaviors will mediate by leader-member exchange.*

## METHOD

### Sample and data collection

Participants to the study were employees in a large healthcare organization in South Italy. They were invited to fill in a paper-and-pencil questionnaire. Questionnaires were distributed to all employees ( $N = 700$ ) during working hours and were returned after 1-2 weeks. The distributed protocol was introduced by means of a short text explaining that the study dealt with employees’ perceptions about HRM practices. Participants were told that the information provided was dealt with strictly confidential, and that the outcomes from the different respondents would be aggregated and analyzed

as a whole. Finally, they were told that there were no right or wrong answers, given the fact that the study was concerned with personal perceptions. Additional ethical approval was not required because the study did not provide medical treatments or other practices that could origin psychological or social malaises to participants. Data were collected in October 2017.

A total of 407 of employees participated to the study (response rate = 58.1%). 229 (56.3%) were women, while 178 (43.7%) were men. Regarding age, 72 (17.7%) were younger than 30 years, 91 (22.4%) were aged 31-40 years, 117 (28.7%) were aged 41-50%, 100 (24.6%) were aged 51-60%, and 27 (6.6%) were older than 60 years. As concerns to their educational level, 171 (42%) held a high-school degree or lower, while 229 (56.3%) held a university degree (7 missing values, 1.7%). In terms of organizational tenure, 96 (23.6%) had been working for less than 5 years, 75 (18.4%) for 5-15 years, 76 (18.7%) for 15-25 years, 92 (22.6%) for 25-35 years, while 68 (16.7%) had been working for more than 35 years. As for their employment contract, 297 (73%) were permanent employees, 57 (14%) held a fixed-term contract, and 52 (12.8%) other employment arrangements (1 missing value; .2%). Finally, as for the professional categories, most of them were professional nurses (56.3%), some medical doctors and paramedical staff (28.2%), few were employees working in the administration (7.8%), some outsourcing human resources (5.2%) and in the end 2.5% (10 missing values) did not declare their professional role within the organization.

## Measures

- *Perception of HRM practices.* The 9-item (e.g., “I feel fairly rewarded for the amount of effort I put into my job”) scale by Gould-Williams and Davies (2005) was used. Responses were assessed through a 5-point scale, from not at all = 1 to completely = 5. Cronbach’s alpha was .90. Scores ranged between 1 and 5.
- *Perceived Organizational Support.* The 8-item (e.g., “The organization really cares about my well-being”) Italian version (Battistelli & Mariani, 2010) scale by Eisenberger and colleagues (1986) was used. Responses were assessed through a 5-point Likert scale, from completely disagree = 1 to completely agree = 5. Cronbach’s alpha was .90. Scores ranged between 1 and 5.
- *Leader-Member Exchange.* The 7-item (e.g., “How would

you characterize your working relationship with your manager”) scale by Scandura and Schriesheim (1994) was used. Responses were assessed through a 5-point scale, from e.g. rarely/not at all/absolutely not = 1 to e.g. very often/very much/absolutely yes = 5. Cronbach’s alpha was .92. Scores ranged between 1 and 5.

- *Work engagement.* The 9-item (e.g., “At my job, I feel strong and vigorous”) Italian version (Balducci, Fraccaroli & Schaufeli, 2010) of the scale by Schaufeli and Bakker (2003) was used. Responses were assessed through a 5-point frequency scale, from never = 1 to always = 5. Cronbach’s alpha was .90. Scores ranged between 1 and 5.
- *Organizational Citizenship Behaviors.* The 15-item (e.g., “Help others who have heavy workloads”) Italian version (Argentero, Cortese & Ferretti, 2008) of the scale by Podsakoff, MacKenzie, Moorman and Fetter (1990) was used. Responses were assessed through a 5-point frequency scale, from never = 1 to always = 5. Cronbach’s alpha was .73. Scores ranged between 1 and 5.

## Data analysis

Preliminary analyses were carried out before proceeding in examining associations between study variables. The expectation maximization method (SPSS 21) was computed to substitute three missing values. Means, standard deviations, and bivariate correlations, were computed to describe variables and their associations with other variables.

After controlling for indicators’ asymmetry indexes, structural equation modelling analyses (Lisrel 9.3) using maximum likelihood estimation methods (along with the indicators’ covariance matrix) were used to evaluate the measurement and structural models concerning study variables and their associations. Given that the sample size was too small for complying with the rule of at least ten cases for each parameter to be estimated (Kline, 2015), we relied on item parceling for estimating latent constructs. This technique has several advantages over item level indicators, such as better model fit, more precise parameter estimates, increased reliability, less biased estimates, and reduced levels of skewness and kurtosis (Bandalos, 2002; Little, Cunningham, Shahar & Widaman, 2002). Exploratory factor analyses were carried out for each scale and their respective items were assigned to parcels in countervailing order according to the size of the factor loading so that the

parcels would have approximately equivalent factor loadings (Weston & Gore, 2006).

Several fit indices were included: the chi-square test ( $\chi^2$ ), the Non-Normed Fit Index (NNFI), the Comparative Fit Index (CFI), the Standardized Root Mean Residual (SRMR), and the Root Mean Square Error of Approximation (RMSEA; with 95% confidence interval lower and upper limits, hereafter 95% CI [LL, UL]). CFI and NNFI  $\geq .90$ , as well as SRMR and RMSEA  $\leq .10$  may suggest acceptable fit, while CFI and NNFI  $\geq .95$ , as well as SRMR and RMSEA  $\leq .08$  may suggest better fit (Hu & Bentler, 1999). Anyway, models' goodness of fit evaluation should rely on evidence from all indices for subsequent acceptance or rejection.

Table 1 depicts study variables' descriptive statistics and zero-order correlations.

Perception of HRM practices positively correlated with perceived organizational support ( $r = .79, p < .001$ ), work engagement ( $r = .40, p < .001$ ), leader-member exchange ( $r = .44, p < .001$ ), and OCB ( $r = .19, p < .001$ ).

Perceived organizational support positively correlated with work engagement ( $r = .39, p < .001$ ), leader-member exchange ( $r = .47, p < .001$ ), and OCB ( $r = .21, p < .001$ ).

Work engagement positively correlated with leader-member exchange ( $r = .32, p < .001$ ) and OCB ( $r = .51, p < .001$ ).

Finally, leader-member exchange positively correlated

with OCB ( $r = .25, p < .001$ ).

Parcels' asymmetry indexes were checked before estimating measurement and structural models. Asymmetry ranged between  $-1.21$  and  $.44$ , while kurtosis between  $-0.43$  and  $1.22$ , showing that assumptions of normality were not violated (i.e., values were below the  $\pm 1.96$  cut-off as recommended by Schaufeli, Bakker & Salanova, 2006) except for Vigor's second parcel's value (2.22) that was slightly higher than the recommended threshold.

Given the cross-sectional nature of our study, before estimating the structural model, a measurement model was estimated in order to provide evidence about the distinctiveness of study variables and the reduced effect of common method variance. We compared a one-factor model, with all parcels loading on the same factor, with a five-factor model with parcels loading on their respective latent variable.

As Table 2 shows, there is a remarkable improvement from the one-factor model to the five-factor model in terms of goodness of fit indexes, thus adequate empirical support for the distinctiveness between study variables allowed to estimate a structural model.

A structural model encompassing hypothesized relations between study variables was estimated. Perception of HRM practices was associated with perceived organizational

**Table 1** – Study variables' descriptive statistics and zero-order correlations

	<i>M (SD)</i>	1	2	3	4	5
1) Perception of HRM practices	2.80 (.67)	(.90)				
2) Perceived organizational support	3.05 (.81)	.79***	(.90)			
3) Work engagement	4.25 (.60)	.40***	.39***	(.90)		
4) Leader-member exchange	3.43 (.83)	.44***	.47***	.32***	(.92)	
5) Organizational citizenship behaviors	4.13 (.43)	.19***	.21***	.51***	.25***	(.73)

\*\*\*  $p < .001$ ; Cronbach's alphas on the diagonal.

**Table 2** – Comparison between measurement models

	$\chi^2$	<i>df</i>	RMSEA	SRMR	CFI	NNFI
One-factor model	2181.15	90	.239	.152	.49	.41
Five-factor model	172.93	80	.053	.033	.98	.97

*Legenda.* *df* = degree of freedom; RMSEA= Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual; CFI = Comparative Fit Index; NNFI = Non-Normed Fit Index.

support, work engagement, and leader-member exchange. Conversely, these three latter variables were associated with organizational citizenship behaviors (see Figure 1).

The structural model showed satisfactory goodness of fit indexes ( $\chi^2 = 221.57$ ,  $df = 84$ , RMSEA = .063, SRMR = .063, CFI = .97, NNFI = .96) and thus was retained. In particular, perception of HRM practices positively predicted perceived organizational support ( $\beta = .70$ ,  $p < .001$ ), work engagement ( $\beta = .46$ ,  $p < .001$ ), and leader-member exchange ( $\beta = .49$ ,  $p < .001$ ). In turn, organizational citizenship behaviors were positively predicted by work engagement ( $\beta = .62$ ,  $p < .001$ ) and leader-member exchange ( $\beta = .12$ ,  $p < .05$ ), while perceived organizational support was not a significant predictor ( $\beta = -.06$ , *ns*). Perception of HRM practices explained 49% in perceived organizational support's, 21% in work engagement's, and 24% in leader-member exchange's variances, while 40% in organizational citizenship behaviors' variance was explained by the predictors. In regard to indirect effects, it was found that only work engagement mediated ( $\beta = .28$ ,  $p < .001$ ) the association of perception of HRM practices with organizational citizenship behaviors.

## CONCLUSIONS

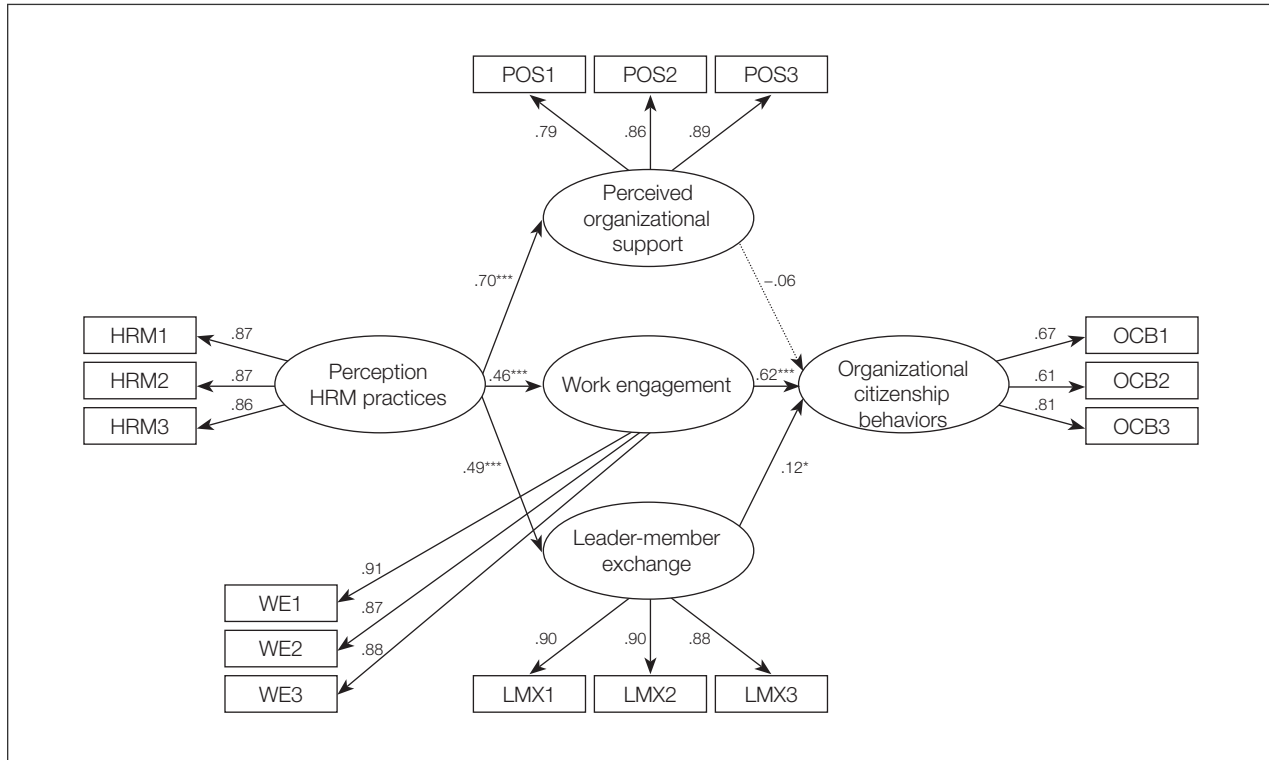
The main aim of the study was to examine the relationship between employees' perception of HRM practices and organizational citizenship behaviors, assessing the mediating role of work engagement, leader-member exchange and perceived organizational support.

## Discussion of findings

Findings partially confirmed the hypotheses and showed interesting implications both for theory development and HRM professional practice.

Accordingly, results suggested that HRM practices were positively associated with OCB even if only work engagement ( $H_1$ ) acted as significant mediating variables. In line with the study by Alfes, Shantz and colleagues (2013), results from the present study in the Italian context showed that work engagement could be considered as a strategic factor to indirectly enhance organizational performance if combined with a positive perception of HRM practices. This result could be precious for HR specialists highlighting that there is no automatic connection between the development of people-based HRM practices and employees' positive organizational behaviors, if there is no personal affective investment in work experience. Yet, direct effects of HRM practices on work engagement and of work engagement on organizational citizenship were found but HRM practices and organizational citizenship were significantly related only through work engagement. Therefore, nurturing and supporting workers' engagement toward one's own work could be a concrete suggestion for HRM policy-makers.

Conversely, neither perceived organizational support nor LMX were found to be significant mediators ( $H_2$  and  $H_3$ ). Yet, results about POS are controversial since it could act as a significant moderator of the relationship between HRM practices and OCB (Alfes, Shantz et al., 2013), as a mediator (Asgari, Silon, Ahmad & Samah, 2008), as an

**Figure 1** – Structural model between study variables

\*\*\*  $p < .001$ , \*  $p < .05$ .

antecedent of job-related affect (Rhoades & Eisenberger, 2002) or as an outcome of positive people management practices (Ahmadi, Tajabadi, Nagahi & Nagahisarchoghaei, 2014). On the other hand, research on LMX showed that it certainly plays a crucial role in strengthening HRM perceptions, encouraging employees to engage into citizenship behaviors because of a positive P/O relationship, also in the health sector (Casimir, Ngee, Ng, Wang & Ooi, 2014; Trincherro, Borgonovi & Farr-Wharton, 2014). However, results from the present study did not confirm this hypothesis. A possible explanation could call into cause the peculiarities of health care occupations that are generally craft-based and sometimes characterized by a low need for management and supervision (Leggat, Bartram & Stanton, 2011). Accordingly, professionals in the healthcare sector (both medical and paramedical staff) generally prefer

working autonomously and might have difficulties in fitting to a context that often requires teamwork, coordination, and integrated work processes.

Therefore, this is an aspect that could certainly be taken into account by future research in order to plan and perform an effective people-based HRM plan also in this specific sector.

Hence, the study was aimed to examine how employees perceive HRM strategies and not simply HRM practices as they are intended by the organization (Alfes, Shantz et al., 2013). This difference is highly important since examining what employees think about the efforts made to value their contribution could help organizations and consequently managers to concretely harmonize practices to employees' needs and therefore to create a shared vision of the organizational aims that would lead to higher performance.

## Limitations and directions for future research

Besides the significant results depicted above, some limitations need to be addressed to suggest potential future avenues for research.

First, the study was cross-sectional and referred to a limited and most specific professional category (i.e., healthcare employees), therefore results cannot not be generalized. Yet, as underlined in the discussion section the homogeneity of the sample could also be seen as a limitation because of some peculiarities of their work often experienced as a vocation (e.g. high levels of work engagement, high autonomy, scarce occasions for teamwork, etc.) and by the specific organization of processes and practices even with reference to HRM in that concrete context. Indeed, results of the present study should be further specified by further investigations considering a wider sample of workers, belonging to different professional categories, and considering both employees in the public and private sector.

Although issues concerning common method variance were controlled both statistically (i.e., through confirmatory factor analyses contrasting a single-factor model against a five factor model) and procedurally (e.g., items were randomized with the questionnaire) (Podsakoff, Bommer, Podsakoff & MacKenzie, 2006), a longitudinal research design, addressed to follow the same organization across time, would have allowed to assess the impact of specific organizational change interventions (e.g., business process reengineering, staff acquisition and/or downsizing, leadership transitions, etc.) on employees' perception of HRM practices and therefore on their organizational behaviors.

Second, self-report measures were used for this study to collect information on HRM practices and employees' attitudes and behaviors toward the organization, relying on a partial and subjective view of the variables investigated. Future research could address this limitation by integrating some objective measures of the same constructs (e.g. employees' participation to HR development and training initiatives, supervisors' assessments and/or comparison with organizational Key Performance Indexes, KPI).

A final limitation that also opens avenues for future research was linked to the temporal collocation of the data collected. The study was conducted in 2017 before the pandemic emergency which profoundly impacted on organizations. Accordingly, even if some most

recent studies in the field still confirm also in this "new normal" the pivotal role of HRM practices in influencing employees' positive organizational behaviors (Caligiuri, De Cieri, Minbaeva, Verbeke & Zimmermann, 2020; Carnevale & Hatak, 2020), the radical transformations occurred within organizations, following to the adoption of remote working modalities and to the consequent emergence of e-leadership patterns, will heavily influence employees' followership, on team identification, on work engagement and consequently on citizenship behaviors. Therefore, in the long run, results coming from the present study will not probably mirror the radical changes occurred to organizational models and behaviors in the post-pandemic context

As recently suggested by some scholars in the field (Hamouche, 2021; Ngoc Su, Tra, Huynh, Nguen & O'Mahony, 2021) within this frame, the unpredictability of the organizational scenario will lead to a complete revision of HRM practices that will surely contribute to redesign some employees' behaviors. Performance management, for example, should no more be bound to the accomplishment of tasks in a definite working time and space rather it should be redesigned as a "smart" management of objectives, that could follow the employees' needs. Similarly training and development practices should be addressed to equip employees with the technical skills as well as with soft skills (e.g., change management, self-efficacy, resilience) that could help workers in mastering technology and in enhancing their employability potential which is particularly special in times of crisis. Furthermore, organizational communication will become even more important to support change, to share a new digital culture, and to motivate employees to cope with these transformations. In this perspective, HRM efficacy is linked to some critical figures: managers and leaders. They could act as a positive model inspiring employees to change, motivating them to react to this difficult moment and deeply affecting trust and engagement. Yet, new flexible leadership styles need to be developed to balance and adjust the individual to the organizational needs.

As a result, although interesting, findings coming from the present study paved the way to future research investigating if and to what extent some pivotal psycho-social constructs like work engagement and organizational citizenship would still be nurtured by traditional people and team management models and in turn would impact on the same positive organizational behaviours.

## Implications for practitioners

Given the limitations described above, this study suggested possible implications mainly in terms of organizational practices. Findings highlighted a positive mediated relationship between employees' perception of HRM practices and organizational citizenship behaviors. In fact, this result was enriched by the evidence that work engagement could fruitfully contribute to mediate this relationship. Conversely, although previous evidence coming from the studies reviewed in the paper and confirming the mediating role of perceived organizational support in the relationship between HRM practices and different kind of employee outcomes (Nasurdin, Hemdi & Phei-Guat, 2008), the present study showed a non-significant contribution of this variable to the research model investigated.

However, the main findings supported a general conclusion about the crucial role played by HRM practices in influencing performance and a positive P/O relationship, thus encouraging organizations to adopt and to maintain a people-based approach to human resource management. Yet, one of the main practical implications that could derive from the study is related to the need to reconsider some core HRM functions such as recruiting, training and development initiatives, capitalizing these practices

as precious occasions to communicate with employees, to motivate and engage them and to share the goals and objectives that concretely make the sense of what they do every day.

This implication is fully attuned with results coming from the most recent 'sustainable performance paradigm' (Spreitzer & Porath, 2012) supporting the role played by people-based HRM practices in designing healthy organizations. According to this view, organizations are the people who live in them: only through their engagement, their motivations, thanks to their skills and knowledge the organization could meet its goals. Considered this evidence and moving from the results discussed above, the main current challenge for HR management is to know the people who work for the organization, to know their motivations, their beliefs, the meaning they attach to work. This information is essential to plan actions and practices that could best interpret their needs and their features, finally reinforcing the person/organization fit.

**Conflict of interests.** On behalf of all authors, the corresponding author states that there is no conflict of interest.

**Data availability.** The dataset generated during and/or analysed during the current study is available from the corresponding author on reasonable request.

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

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# COVID-19 vaccine risk perception in cancer patients: Psychometric validation of a new screening tool

Simone Cheli<sup>1,2</sup>, Maria Simona Pino<sup>3</sup>, Marta Floridi<sup>2</sup>,  
Veronica Cavalletti<sup>2</sup>, Luisa Fioretto<sup>3</sup>, Gil Goldzweig<sup>4</sup>

<sup>1</sup> School of Human Health Sciences, University of Florence, Florence, Italy

<sup>2</sup> Center for Psychology and Health, Tages Charity, Florence, Italy

<sup>3</sup> Dipartimento Oncologico, USL Toscana Centro, Florence, Italy

<sup>4</sup> The Academic College of Tel Aviv-Yaffo, Tel-Aviv, Israel

simone.cheli@tagesonlus.org

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• **ABSTRACT.** Obiettivo del presente studio-pilota è quello di validare un nuovo strumento di screening per valutare la percezione del rischio e la tendenza ad esitare nei confronti dei vaccini anti-COVID-19 nei pazienti oncologici. Abbiamo reclutato pazienti (n = 356) che fossero in trattamento o in follow-up. Tutti i partecipanti hanno completato diverse misure di percezione del rischio, fiducia nelle istituzioni, aderenza al trattamento e distress psicosociale. Lo scree plot e la parallel analysis suggeriscono una struttura unifattoriale (varianza spiegata = 47.816%). La scala risulta essere uno strumento affidabile costituito da 7 item ( $\alpha$  di Cronbach = .806;  $\Omega$  di McDonald's = .810). Correlazioni e confronti con altre misure hanno confermato la validità concorrente e predittiva. La nuova misura riporta una moderata correlazione ( $r = .410$ ;  $p < .001$ ) con la non-aderenza al trattamento, mentre la correlazione con il distress non è significativa. In conclusione, il nuovo questionario sembra essere uno strumento affidabile e valido per valutare la percezione del rischio e la fiducia nei reparti oncologici relativamente alla vaccinazione in pazienti oncologici. Sono necessarie ulteriori ricerche per confermarne la struttura unifattoriale e per comprendere meglio i meccanismi psicologici alla base della reticenza nei confronti della vaccinazione.

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• **SUMMARY.** This study aimed at pilot-testing a new screening tool for assessing risk perception of and hesitancy about anti-COVID-19 in patients diagnosed with cancer. We recruited consecutive cancer patients (n = 356) who were either in treatment or follow-up. All the participants completed several measures of risk perception, confidence in safeguards, treatment adherence, and psychosocial distress. Scree plot and parallel analysis suggest a unifactorial structure (explained variance = 47.816%). The total scale was found a reliable 7-item measure (Cronbach's  $\alpha = .806$ ; McDonald's  $\Omega = .810$ ). Correlations and comparisons to other measures confirmed concurrent and predictive validity. The new measure reports a moderate correlation ( $r = .410$ ;  $p < .001$ ) with treatment non-adherence, whereas the correlation with distress was not significant. In conclusion, the new measure seems to be a reliable and valid tool for assessing risk anti-COVID-19 vaccine hesitancy in patients diagnosed with cancer. Further research is needed to confirm the unifactorial structure or better understand the underlying psychological mechanisms of vaccine hesitancy.

**Keywords:** Cancer, Confidence in safeguards, COVID-19, Health beliefs, Risk perception, Vaccination

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## INTRODUCTION

The COVID-19 pandemic has dramatically impacted the national healthcare systems (Rafiq, Batool & Bazaz, 2020) and psychosocial wellbeing (Xiong et al., 2020). Patients diagnosed with cancer are at greater risk for both being more vulnerable to severe forms of COVID-19 (Dai et al., 2020) and being more affected by disruption and delays in cancer care services (Richards, Anderson, Carter, Ebert & Mossialos, 2020).

The perception of anti-COVID-19 vaccination represents one of the biggest challenges of healthcare generally speaking (Fathalla Aboelsaad et al., 2021), and more specifically with regard to cancer patients (Fanciullino, Ciccolini & Milano, 2021): low vaccination rates are reported to increase the risk of infection and serious outcomes, especially in vulnerable individuals. On the one hand, studies on general population report a recurrent anti-COVID-19 hesitancy higher in those with younger age, lower income and education (Byrne et al., 2021). Moreover, general negative attitudes and negative beliefs about healthcare systems were found to be related to the reluctance to and perception of risk about vaccination. On the other hand, little is known about perception risk and confidence in safeguards in cancer patients and their relation to attitudes towards vaccination. The only two available studies report contrasting results: a Polish online survey highlights a positive attitude towards among cancer patients (Brodziak et al., 2021), whereas a Mexican one a recurrent hesitancy (Villarreal-Garza et al., 2021). These divergent outcomes may be due both to cultural differences and to a limited reliability of the measures used. Indeed, both studies did not use standardized measures and relied on online surveys with recruitment via social media.

The current study aimed at developing a standardized measure for assessing risk perception of and hesitancy about vaccination in cancer patients. The new measure was validated psychometrically through consolidated procedures found in the literature (Chan, 2014): (i) a Delphi method was used to create a pool of items through focus groups; (ii) the selected items were then tested in a small group of patients diagnosed with cancer; (iii) after a final review the questionnaire was preliminarily tested in a statistically significant sample of patients (see Procedures and statistical analysis). Specifically, the study aimed at developing a quick screening tool for hospital settings, pilot-testing it directly on cancer patients who were participating in the vaccination

campaign within an oncology department. In Appendix we report the psychometrically validated Italian version of the new questionnaire and a translated English version.

## MATERIALS AND METHODS

### Sample

Three-hundred-fifty-six consecutive cancer patients were recruited from the Department of Oncology, USL Toscana Centro (broad metropolitan area of Florence with over 1.5 million inhabitants) during the vaccination campaign. Inclusion criteria were to be 18 years of age or older, have received a cancer diagnosis, be in treatment or in follow-up, and being able to read and sign the informed consent form in Italian.

The mean age was 63.17 ( $SD = 11.93$ ) and 65.4% were female (see Table 1). Most respondents had received a new diagnosis (72.8%) and were under treatment (70.2%). Regarding the type of tumor, the majority were patients diagnosed with breast cancer (40.7%).

### Measures

- *Coronavirus Risk Perception (CRP)*. CRP is an 8-item measure on a 5-point Likert-type scale assessing the perceived risk perception during COVID-19 (Kanovsky & Halamová, 2020). The scale included items such as “There is a chance, no matter how small I could get the Coronavirus” and the internal reliability of the scale (Cronbach’s alpha) in the current study was .787.
- *Confidence in Coronavirus Safeguards (CCS)*. CCS is a 10-item measure (on a 5-point Likert-type scale) assessing the confidence in the country safeguards during COVID-19 (Kanovsky & Halamová, 2020). The scale is comprised of items such as “Shops, pharmacies, and drugstores are prepared for Coronavirus”; “My fellow workers behave with adequate caution in regard to the spread of Coronavirus”; and the internal reliability of the scale (Cronbach’s alpha) in the current study was .813.
- *Depression, Anxiety, Stress Scale (DASS-21)*. It is a measure aimed at assessing symptomatology through 3 single scales and a total score (Henry & Crawford, 2005). The questionnaire comprises 21 items, each on a 4-point

**Table 1** – Descriptives of the sample

Age years ( <i>Mean ± SD</i> )	63.17 ± 11.93
Education years completed ( <i>Mean ± SD</i> )	11.86 ± 4.64
Sex n (%)	
Male	123 (34.6%)
Female	233 (65.4%)
Relationship status n (%)	
Single	23 (6.5%)
Married	244 (68.5%)
Cohabiting	32 (9%)
Divorced	18 (5.1%)
Widowed	38 (10.7%)
Housing condition n (%)	
Living with my partner/husband/wife	206 (57.9%)
Living by myself	46 (12.9%)
Living with one or more roommates	1 (.3%)
Living with my family	95 (26.7%)
Other	8 (2.2%)
Job condition n (%)	
Full time	100 (28.1%)
Part time	43 (12.1%)
Casual	3 (.8%)
Stood down	1 (.3%)
Unemployed	10 (2.8%)
Not working by choice	23 (6.5%)
Student	2 (.6%)
Retired	169 (47.5%)
Job condition before COVID-19 n (%)	
Full time	136 (38.2%)
Part time	33 (9.3%)
Casual	3 (.8%)
Stood down	–
Unemployed	9 (2.5%)
Not working by choice	18 (5.1%)
Student	1 (.3%)
Retired	151 (42.4%)

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Cancer diagnosis n (%)	
New diagnosis	259 (72.8%)
Recurrence	84 (23.6%)
Cancer type n (%)	
Breast	145 (40.7%)
Stomach/bowel cancer	30 (8.4%)
Lung	22 (6.2%)
Gynecological cancer	26 (7.3%)
Prostate cancer	32 (9%)
Testicle cancer	3 (.8%)
Hematological cancer (leukemia, lymphoma)	17 (4.8%)
Other	79 (22.2%)
Current treatment n (%)	
In treatment	250 (70.2%)
Follow up	91 (25.6%)
Treatment type n (%)	
Chemotherapy	109 (30.6%)
Immune therapy	50 (14%)
Hormone therapy	67 (18.8%)
Radiation therapy	20 (5.6%)
Other	23 (6.5%)
PCRS ( <i>Mean ± SD</i> )	21.79 ± 6.18
CCSS ( <i>Mean ± SD</i> )	35.63 ± 6.25
CTA ( <i>Mean ± SD</i> )	17.12 ± 6.27
DASS-21 ( <i>Mean ± SD</i> )	9.77 ± 10.68
DASS-21 Depression subscale ( <i>Mean ± SD</i> )	6.97 ± 7.18
DASS-21 Anxiety subscale ( <i>Mean ± SD</i> )	7.76 ± 8.13
DASS-21 Stress subscale ( <i>Mean ± SD</i> )	9.77 ± 10.68

*Legenda.* PCRS = Perceived Coronavirus Risk Scale; CCSS = Confidence in Coronavirus Safeguard Scale; CTA = Cancer Treatment Adherence during COVID-19; DASS-21 = Depression Anxiety Stress Scale.

Likert-type scale. The internal reliability of the scale (Cronbach's alpha) in the current study was .951.

- *Cancer Treatment Adherence during COVID-19 (CTAC)*. CTAC is a newly developed measure by first author and colleagues to assess adherence in cancer patients during the pandemic through a single total score (Author et al., 2021). It includes 8 items on a 5-point Likert-type scale and has been linguistically and psychometrically validated in seven languages (Italian, Spanish, Turkish, German-Germany, German-Austria, Chinese, and Swedish). The internal reliability of the scale (Cronbach's alpha) in the current study was .713.

## Procedure and statistical analysis

The aim of the study was to psychometrically validate a new screening tool for assessing risk perception and confidence in cancer units about anti-COVID-19 vaccination in cancer patients in hospital settings, namely COVID-19 vaccine risk perception in cancer patients (CVRC). All the recruited patients signed an informed consent form, and the study was approved by the institutional review board of the first author. The questionnaire was created through the following standard procedure (Chan, 2014): (i) we conducted a focus group ( $n = 6$ ) with cancer patients and a focus group ( $n = 6$ ) with multidisciplinary experts (i.e. psycho-oncologists, medical oncologists, cancer nurses) in cancer care; (ii) a first version of the CRVC was then created by all the authors; (iii) another focus group of cancer patients ( $n = 8$ ) preliminarily tested the content validity and understandability of the first version. The seven selected items referred to both confidence in cancer unit during vaccination campaign (see Appendix: items 1, 2, 6, and 7) and beliefs about vaccine (see Appendix: items 3, 4, and 5), with higher score indicating higher risk perception about being vaccinated. An English version of the questionnaire has been created (through forward and backward translations) and is included together with the original Italian one in the Appendix.

Finally, CVRC was tested in the study sample ( $n = 356$ ). First, the single items were examined to verify that their distribution was similar to a Gaussian. For items with non-normal distribution, an increasing monotonic transformation (Fox, 2008) of the data was applied.

Second, reliability was calculated through Cronbach's

alpha, and an exploratory Principal Components Analysis (PCA) tested the factorial structure of the new questionnaire (Jolliffe & Cadima, 2016). The factorial structure was confirmed through scree plot and parallel analysis (Patil, Surendra, Sanjay & Donavan, 2017), whereas the reliability of a total score through McDonald's Omega (Hayes & Coutts, 2020).

Finally, content and concurrent validity were examined by calculating correlations (Pearson's  $r$ ) between CVRC and CRP, CCS, and CTAC. Patients who did not complete all items were excluded from the analyzes ( $n = 37$ ; 12.92% of the total number of patients approached).

## RESULTS

The values of kurtosis and skewness (Table 2) show a recurrent right-skewed distribution that is particularly relevant for items 5 and 7. An increasing monotonic transformation of the data was then performed normalizing item 5 (skewness after transformation = 1.298) and 7 (skewness after transformation = 1.414) distribution. All subsequent analyzes were therefore conducted with the normalized scores of items 5 and 7.

CVRC shows a good reliability through Cronbach's alpha ( $\alpha = .806$ ). As reported in Table 3, the alpha value does not increase if the single items are deleted.

Scree plot and parallel analysis were performed to define the factorial structure (see Figure 1). The scree was only partially significant (leaving room for an even limited possibility of a second factor), while the parallel analysis gave robust results. We estimated mean and percentile eigenvalues (PCA) by assuming a number of random correlation matrices to generate equal to 500 and a percentile of eigenvalues equal to 95. Factor 1 was confirmed by a percentile eigenvalue (1.278479) significantly smaller than the one obtained by PCA (3.301), whereas factor 2 was discharged by a percentile eigenvalue (1.173488) greater than the one obtained by PCA (1.005). Finally, MacDonal's Omega (Hayes & Coutts, 2020) was calculated ( $\Omega = .810$ ), confirming the reliability of a total score as the sum of all the items (CVRC total score;  $M = 12.32$ ;  $SD = 5.13$ ).

Therefore, a PCA (see Table 4) was performed with 1 as fixed number of factors. The obtained factor explained 47.157% of variance (eigenvalue = 3.301). Keiser-Meyer-Olkin measure (KMO = .789) indicated that high proportion

**Table 2** – Descriptives of the items of the new measure

	<i>Mean and SD</i>	<i>Skewness and Standard Error</i>	<i>Kurtosis and Standard Error</i>
<i>Item 1</i> - My instinct tells me that the Coronavirus vaccine is probably ineffective.	2.00 (1.23)	1.07 (.12)	.08 (.25)
<i>Item 2</i> - My instinct tells me that the Coronavirus vaccine is probably dangerous.	1.82 (.95)	1.05 (.12)	.75 (.25)
<i>Item 3</i> - My cancer unit is not taking the trouble to give me adequate information about the vaccine for Coronavirus.	1.97 (1.19)	1.12 (.13)	.32 (.26)
<i>Item 4</i> - My cancer unit is not taking the trouble to protect me from the side effects of the vaccine for Coronavirus.	1.91 (1.16)	1.18 (.13)	.49 (.26)
<i>Item 5</i> - Going to hospital for the vaccination is more of a risk than staying at home and skipping it.	1.55 (1.05)	2.10 (.12)	3.63 (.25)
<i>Item 6</i> - From the start of the vaccination for Coronavirus. I have avoided finding out how and when to be vaccinated.	1.69 (1.10)	1.66 (.13)	1.86 (.26)
<i>Item 7</i> - I think that the Coronavirus vaccine is more dangerous than Coronavirus itself.	1.46 (.89)	2.25 (.12)	4.96 (.25)

of the variance of the items might be a result of underlying factors (Kaiser, 1974). Bartlett's Test (Chi-square = 762.942;  $df = 21$ ;  $p < .001$ ) (Bartlett, 1937) supported the hypothesis that the correlation matrix is different from identity matrix and may subject to factor analysis. Table 5 presents factor loadings for PCA.

Then, construct and concurrent validity were explored through Pearson's  $r$  correlation (see Table 6) between the CRVC total score and measures of confidence in safeguards (CCS), risk perception (CRP), treatment adherence (CTAC), and psychosocial distress (DASS-21).

CVRC total score reported a significant positive correlation with treatment adherence ( $r = .410$ ;  $p < .001$ ),

a significant positive (even small) correlation with risk perception ( $r = .168$ ;  $p < .001$ ), and a significant negative (even small) correlation with confidence in safeguards ( $r = -.110$ ;  $p < .001$ ). Focusing on the stronger association, we can suggest that the higher the total score the lower the treatment adherence.

Finally, age, sex, and education did not report a significant correlation with CRVC total score ( $p > .05$ ). Neither sex, nor time from diagnosis showed a significant difference at Student's  $t$  between males and females ( $p > .05$ ) and between new diagnosis and recurrence or in-treatment or follow-up ( $p > .05$ ), respectively. No significant differences were found regarding the type of either treatment or cancer.

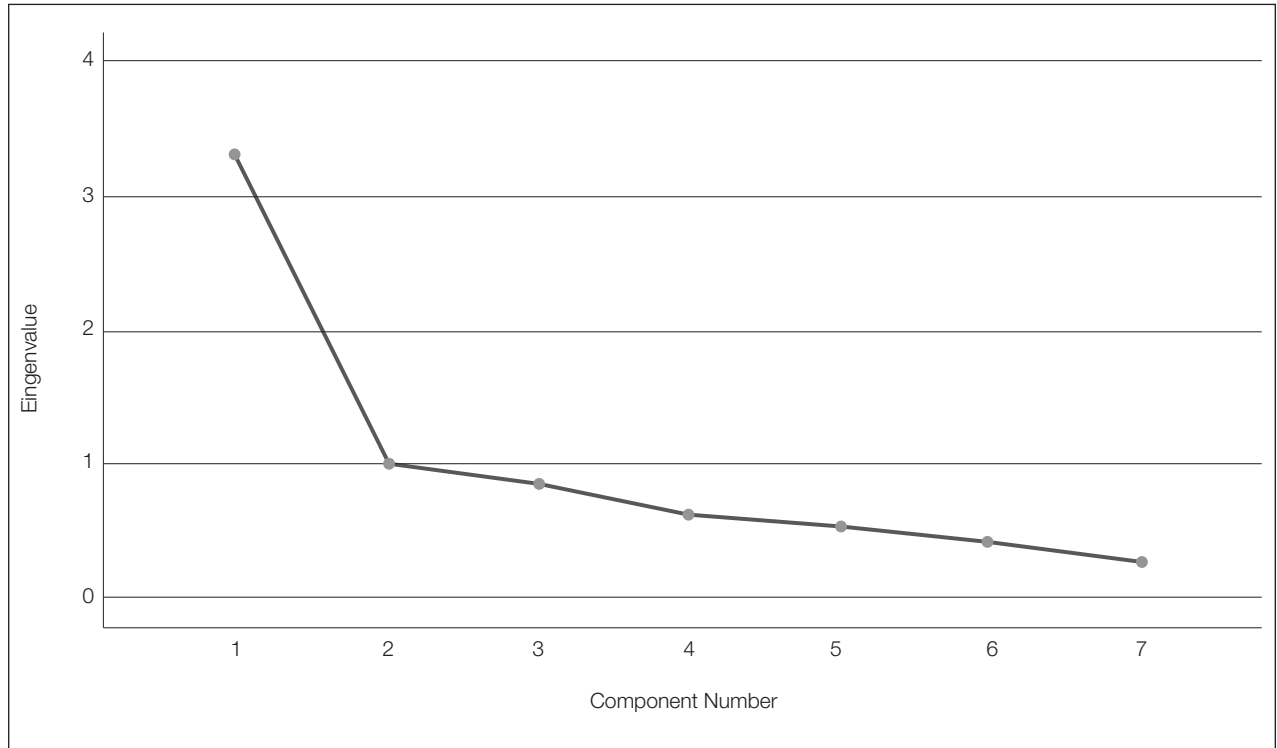


**Table 3** – Descriptives and reliability of the items of the new measure

Cronbach's $\alpha = .806$	Mean if item deleted*	Variance if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
<i>Item 1</i> - My instinct tells me that the Coronavirus vaccine is probably ineffective.	10.33	20.00	.44	.80
<i>Item 2</i> - My instinct tells me that the Coronavirus vaccine is probably dangerous.	10.53	20.92	.53	.78
<i>Item 3</i> - My cancer unit is not taking the trouble to give me adequate information about the vaccine for Coronavirus.	10.35	18.72	.59	.77
<i>Item 4</i> - My cancer unit is not taking the trouble to protect me from the side effects of the vaccine for Coronavirus.	10.41	18.54	.64	.76
<i>Item 5</i> - Going to hospital for the vaccination is more of a risk than staying at home and skipping it.	10.79	20.35	.54	.78
<i>Item 6</i> - From the start of the vaccination for Coronavirus. I have avoided finding out how and when to be vaccinated.	10.64	20.36	.49	.79
<i>Item 7</i> - I think that the Coronavirus vaccine is more dangerous than Coronavirus itself.	10.89	21.15	.57	.77

Note: Total score Mean = 12.32; Total score Standard Deviation = 5.13.

**Figure 1** – Scree Plot



**Table 4** – Total variance explained

Factor	Eigenvalue	% of variance	Cumulative %
1	3.301	47.157	47.157

*Note.* Extraction method: Principal Component Analysis (fixed number of factors = 1).

**Table 5** – Components matrix

	<b>1</b>
<i>Item 1</i> - My instinct tells me that the Coronavirus vaccine is probably ineffective.	.587
<i>Item 2</i> - My instinct tells me that the Coronavirus vaccine is probably dangerous.	.668
<i>Item 3</i> - My cancer unit is not taking the trouble to give me adequate information about the vaccine for Coronavirus.	.730
<i>Item 4</i> - My cancer unit is not taking the trouble to protect me from the side effects of the vaccine for Coronavirus.	.760
<i>Item 5</i> - Going to hospital for the vaccination is more of a risk than staying at home and skipping it.	.687
<i>Item 6</i> - From the start of the vaccination for Coronavirus. I have avoided finding out how and when to be vaccinated.	.642
<i>Item 7</i> - I think that the Coronavirus vaccine is more dangerous than Coronavirus itself.	.718

*Note.* Extraction method: Principal Component Analysis (fixed number of factors = 1)

**Table 6** – Intercorrelations among measures

	<b>PCRS</b>	<b>CCSS</b>	<b>CTA</b>	<b>DASS_T</b>
Total score	Pearson correlation .168**	-.110*	.410**	.022
	Sig. (2-tailed)	.002	.042	.000
		.710		

*Legenda.* PCRS = Perceived Coronavirus Risk Scale; CCSS = Confidence in Coronavirus Safeguard Scale; CTA = Cancer Treatment Adherence during COVID-19; DASS\_T = total score of Depression Anxiety Stress Scale.

## DISCUSSION

Our study aimed at validating a new screening tool for assessing risk perception of and confidence in safeguards about anti-COVID-19 vaccination campaign in patients diagnosed with cancer. To our knowledge this is the first study doing this. Indeed, only two studies with contrasting results and methodological biases (e.g. online anonymous recruitment; non-validated measures) have been published about attitudes about anti-COVID-19 vaccination in those diagnosed with cancer (Brodziak et al., 2021; Villarreal-Garza et al., 2021). Further research is needed to better understand factors that may influence adjustment to COVID-19 therapeutic and preventive strategies in patients at high risk. The resolution of pandemic seemingly happens through a deeper understanding of attitudes and beliefs about vaccines, COVID-19 and healthcare systems (Akarsu et al., 2021; Habas et al., 2020).

Our results suggest that CVRC is a reliable and valid tool for assessing negative attitudes about vaccination in patients diagnosed with cancer. We obtained mixed results in regard to the factorial structure. PCA seemingly suggested a two-factor structure, while parallel analysis strongly supported a unifactorial structure. On the one hand, construct and concurrent validity suggests the reliability of the CVRC total score and so of an unifactorial structure. On the other hand, we previously hypothesized two subscales, consistently with the semantic contents of the items: one about “non-confidence in cancer units” (items 3, 4, and 5), and one about “negative vaccine beliefs” (items 1, 2, 6, and 7). This discrepancy may be due to either a single dimension of vaccine hesitancy regardless of the specific contents of the items, or a small sample size that does not allow to confirm

the two-factor structure. What we present here are the results of a pilot-study which will be followed by a confirmatory factor analysis (CFA).

That said, our analysis suggests the validity of a total score. On the one hand, socio-demographic and medical background is seemingly not affecting the results. On the other hand, the only significant and moderate correlation was between vaccine hesitancy and treatment adherence, confirming the concurrent validity of the measure. Those with high hesitancy are at greater risk for reducing adherence.

We hypothesize that there are numerous variables in terms of both specific vaccination attitudes and personality traits that seem not to expose the person to greater or lesser hesitancy. Further research should explore these possible predictors of vaccine hesitancy. In our future confirmatory study (CFA), we aim to extend the variables for concurrent validity.

Importantly, there were two main limitations. First, although our sample size is acceptable, it does allow for the stratification of CVRC score based on the type of diagnosis and treatment. Given the complexity of cancer care, more studies are needed. Second, the total score did not show a correlation with psychosocial distress (DASS-21). Therefore, the present study did not report a predictive validity with respect to psychopathological measures. Future research will need to show whether this is a CVRC limitation or the result of different and not necessarily pathological psychosocial mechanisms (e.g. health beliefs; personality traits).

In conclusion, our pilot-study suggests the validity of the newly developed measure of anti-COVID-19 vaccine hesitancy in cancer patients. Further research should confirm the unifactorial structure and extend its predictive validity.

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## APPENDIX

### COVID-19 vaccine risk perception in cancer patients – English version

INSTRUCTIONS: Please read each sentence carefully before answering. Use the scale of 5 alternatives shown next to each sentence, choosing the number you consider most appropriate to represent what is true for you.

- 1 = Completely disagree
- 2 = Disagree
- 3 = Don't know
- 4 = Agree
- 5 = Completely agree

Item	1 Completely disagree	2 Disagree	3 Don't know	4 Agree	5 Completely agree
1. My instinct tells me that the Coronavirus vaccine is probably ineffective.					
2. My instinct tells me that the Coronavirus vaccine is probably dangerous.					
3. My cancer unit is not taking the trouble to give me adequate information about the vaccine for Coronavirus.					
4. My cancer unit is not taking the trouble to protect me from the side effects of the vaccine for Coronavirus.					
5. Going to hospital for the vaccination is more of a risk than staying at home and skipping it.					
6. From the start of the vaccination for Coronavirus, I have avoided finding out how and when to be vaccinated.					
7. I think that the Coronavirus vaccine is more dangerous than Coronavirus itself.					

## Covid-19 vaccine risk perception in cancer patients – Italian version

ISTRUZIONI: La preghiamo di leggere con attenzione ogni frase prima di rispondere. Utilizzi la scala a 5 alternative che è riportata accanto ad ogni frase, scegliendo il numero che ritiene più appropriato nel rappresentare quel che per lei è vero.

1 = Totalmente in disaccordo

2 = In disaccordo

3 = Non so

4 = D'accordo

5 = Totalmente d'accordo

Item	1 Totalmente in disaccordo	2 In disaccordo	3 Non so	4 D'accordo	5 Totalmente d'accordo
1. Il mio istinto mi dice che è probabile che il vaccino per il Coronavirus sia inefficace.					
2. Il mio istinto mi dice che è probabile che il vaccino per il Coronavirus sia pericoloso.					
3. La mia unità oncologica non si preoccupa di informarmi adeguatamente sul vaccino per il Coronavirus.					
4. La mia unità oncologica non si preoccupa di tutelarmi dagli effetti collaterali del vaccino per il Coronavirus.					
5. Andare in ospedale a fare il vaccino è più rischioso che stare a casa e saltarlo					
6. Dall'inizio della vaccinazione per il Coronavirus, ho evitato di informarmi su come e quando essere vaccinato.					
7. Ritengo che il vaccino per il Coronavirus sia più pericoloso del Coronavirus stesso.					

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# The Interpersonal Style Questionnaire (ISQ): Factor structure and preliminary validity

Rachele Mariani<sup>1</sup>, Attà Negri<sup>2</sup>, Gian Maria Mussino<sup>3</sup>, Marco Lauriola<sup>4</sup>

<sup>1</sup> Department of Dynamic and Clinical Psychology, and Health Studies, Sapienza University of Rome, Italy

<sup>2</sup> Department of Human and Social Sciences, University of Bergamo, Italy

<sup>3</sup> Private Practice, Rome, Italy

<sup>4</sup> Department of Psychology, Sapienza University of Rome, Italy

rachele.mariani@uniroma1.it

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✎ **ABSTRACT.** Alcune teorie cliniche che assumono una prospettiva orientata alla complessità concepiscono la personalità come un fenomeno processuale: attraverso esperienze ripetute con gli altri, alcuni modelli relazionali emergono e creano gradualmente un senso coerente di sé. L'*Interpersonal Style Questionnaire (ISQ)* è stato progettato secondo queste teorie. Vengono presentati due studi: il primo è la validazione preliminare della struttura fattoriale dell'ISQ condotta su 547 adulti italiani. L'analisi fattoriale esplorativa ha evidenziato un modello a 7 fattori. Il secondo studio ha convalidato questo modello usando un campione indipendente ( $N = 506$ ; 377 femmine) e ha testato la validità concorrente del ISQ. L'ISQ si è rivelato essere un promettente nuovo questionario per valutare le manifestazioni interpersonali della personalità con validità e affidabilità soddisfacenti.

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✎ **SUMMARY.** Some clinical theories assuming a complexity-oriented perspective conceive personality as a processual phenomenon: through repeated experiences with others, some relational patterns emerge and gradually create a coherent sense of self. The *Interpersonal Style Questionnaire (ISQ)* has been designed according to these theories. Study 1 presented the preliminary validation of the ISQ factor structure. Italian adults ( $N = 547$ ; 367 females) completed the ISQ and Ten Item Personality Measure (TIPI). Seven factors have been found using exploratory factor analysis, labeled based on item content: I. Dependent-Independent, II. Withdrawn-Sociable, III. Confident-Resigned, IV. Responsible-Impulsive, V. Ambitious-Modest, VI. Open-Stable and VII. Gregarious-Competitive. Study 2 cross-validated the seven factors using an independent sample ( $N = 506$ ; 377 females) and Exploratory Structural Equation Modeling (ESEM). ISQ has been tested for concurrent validity using, International Personality Item Pool Representation of Big Five Measure, (IPIP-BFM-50); Mini Questionnaire of Personal Organization (MQPO); Reflective Function Questionnaire, RFQ; Relationship Questionnaire (RQ). The seven-factor model achieved close-fit test, and the ISQ items were found to measure the corresponding factors with sufficient reliability. Dependent-Independent and Confident-Resigned were associated with Neuroticism, Responsible-Impulsive with Conscientiousness, and Withdrawn-Sociable and Gregarious-Competitive with Agreeableness. Open-Stable and Ambitious-Modest were less strongly associated with the canonical Big-Five. The ISQ factors also showed significant correlations with the clinical scales, especially Dependent-Independent with RQ Anxious/Self Model, RFQ Certainty about mental states, and MQPO Contextualized scores. In conclusion, the ISQ is a promising new questionnaire for assessing the interpersonal manifestations of personality with satisfactory validity and reliability.

**Keywords:** Interpersonal styles, Personality, Personality meaning organization, Relational patterns

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## INTRODUCTION

The most widely accepted personality theories focus on the necessity of integrating biological determinants with psychological and environmental ones (Hopwood et al., 2011). Since Allport's definition, personality is a dynamic psychophysical system organization that determines people's unique adjustment to the environment (Allport, 1971). Accordingly, personality is considered the result of interaction between a biologically determined temperament and character, acquired due to interchanges with the environment. In this view, temperament involves procedural memory, pre-semantic knowledge, and affective valence; character corresponds to the processes of symbolization and abstraction based on conceptual learning. Essentially, temperament represents individual modalities that govern the acquisition of emotion-based, automatic behavioral traits and habits that remain relatively stable throughout one's life span (Cloninger, Svrakic & Przybeck, 1993).

In this study, we sought to investigate personality from another epistemological point of view. We adopted a complexity-oriented perspective on the human being, in which subjectivity affects the investigated phenomena circularly - especially the mental ones. Scientific acquisitions are only inter-subjectively shared temporary hypotheses, and the circularity of the interactions systems is the most plausible explanation of reality (Brown, 2009; George & Jones, 2001; Hatch & Cunliffe, 2013; Negri, Andreoli, Belotti, Barazzetti & Martin, 2019). This paradigm shift leads the human being to no longer be conceived and studied as an isolable entity. Instead, personality is considered a processual phenomenon emerging from ongoing individual-context relationships, and therefore it has to be investigated within the constraints and possibilities of such relationships. For this reason, we sought to develop an assessment tool that focused on the interpersonal manifestations of personality as the most defining and distinctive aspects of subjective functioning.

The importance of investigating interpersonal ability in relationships with others is growing. For instance, new instruments have been developed to assess interpersonal characteristics, such as empathy, social and emotional intelligence (Buhrmester, Furman, Wittenberg & Reis, 1988; Di Girolamo, Giromini, Winters, Serie & De Ruiter, 2019; Reniers, Corcoran, Drake, Shryane & Völlm, 2011). Moreover, exploring interpersonal functioning is relevant because it is

the basis of many significant psychological experiences, such as personal satisfaction, self-esteem, and wellbeing. Adapting behavior to new contexts, people, and experiences, is also linked with psychopathological relapse (Kim, Pilkonis & Barkham, 1997). The impact of interpersonal relationships on people's functioning is worth exploring to foster an understanding of interpersonal competencies (Gironimi et al., 2016).

The *Interpersonal Style Questionnaire (ISQ)* has been designed within this theoretical frame. In other words, we assumed that the individual identity is dotted with self-other relationships that are structured during development and through repeated experiences in different contexts that make some relational patterns more stable than others and reproduced more easily.

## Self, environment, and interpersonal styles

As biological systems, individuals are governed by physical and chemical laws of spontaneous self-organization (Corning, 2007). However, individuals are equipped to connect with the social and physical environment, and this capability enables adapting and learning processes that guide the individual's development in an interplay of exogenous and endogenous constraints. Neurosciences' contribution has extended our knowledge of self-organization and adaptation abilities in areas like emotion regulation (Gross, 2008), attachment (Carver, 1997; Simmons, Gooty, Nelson & Little, 2009), mentalization (Bateman & Fonagy, 2016; Karterud & Kongerslev, 2019), subjective time in psychotherapy (De Pascale & Maiello, 2010), consciousness, language, and narratives (Bucci, 2021; Salvatore, De Luca Picione, Cozzolino, Bochicchio & Palmieri, 2021).

Guidano (1987, 1991), recognizing the value of the attachment relationship, developed the Personal Meaning Organization (PMO) concept to describe the gradual construction of a coherent sense of self through interactions with others. The PMO model pays specific attention to the self-organization's categories that give meaning to living experience and a consistent sense of self. Such personal meaning and sense are clearly expressed by their processual definition: "A PMO [...] a unitary ordering process in which continuity and internal coherence are sought in the specificity of the formal, structural properties of its knowledge

processing (i.e., flexibility, generativity, and abstracting level), rather than in the definite semantic properties of its knowledge products. This leads to the adoption of a systems/process-oriented methodology [...]” (Guidano, 1987 p. 33). For this reason, we wondered if one can identify a PMO with an assessment methodology focused on the subject-environment relationship.

## The four main interpersonal styles

In the present study, we referred to three different theories (Carli & Paniccia, 2003; Guidano, 1982; Ugazio, 1998, 2012), which, independently and from different perspectives, converge on the assumption that few prototypical interpersonal styles, grounded in basic emotions, are prevalent and recurrent in man’s way of relating to his context (Cameron, Benz & Reed, 2021; Hyatt et al., 2018; Mariani, Mussino & Negri, 2018; Nardi, Arimatea, Vernice & Bellantuono, 2012; Riggio, Tucker & Coffaro, 1989; Rohmann, Hanke & Bierhoff, 2019; Ugazio, Negri & Fellin, 2015;).

The ISQ items were developed to cover the recurrent content in four interpersonal styles. These styles are dotted by the elements that, in the three theories taken as reference, are common to four relational and personality organizations that frequently emerge in clinical practice and underlie the main psychopathologies in their most rigid form. They can be briefly described as follow.

*Free-dependent*: this style is centered on the management of proximity-distance from others. People showing this style perceive the world as full of dangers and threats. For this reason, some people seek to stay emotionally close and tied to others to find protection; other people seek to face the risks and challenges that the world poses to demonstrate their independence and strength. In both instances, depending on others to cope with this sense of insecurity is experienced as humiliating and frustrating. Fear and courage are the emotions around which these people’s lives revolve.

*Responsible-transgressive*: the core of this style is the management of desires with others. People showing this style feel that satisfying their wants and needs has a negative connotation because they feel guilty and bad toward others. At the same time, sacrificing and caring for the needs of others makes feel good and right. However, when people renounce or sacrifice themselves for others, they also feel disappointed or mortified, primarily if others do not act in

the same sacrificing manner. People showing this style can be generous, responsible, and therefore very dedicated to their duties and respectful of the rules, or they can be impulsive, selfish, and transgressive, accepting to feel bad in their own and other people’s eyes. Guilty and innocence are the predominant emotions of people adopting this style.

*Winner-loser*: people with this style are focused on managing power in relationships. Their main goal is to define who has the power to make decisions. They try to find the winner or loser in any situation, defined by reaching or not reaching the aspired standards. Because there are no winners without losers, they feel themselves engaged in endless competition with others. Some people take the position of winner due to their determination and tenacity, which gives them a great sense of superiority and self-esteem. Still, at the same time, they feel threatened by failing and receiving negative criticism from those who are always trying to fight. Some people take the loser position, deriving their identity validation by becoming submissive to others or removing themselves from the competition, but they feel they are on the wrong side. The predominant emotions felt by people reflecting this style are shame, embarrassment, as opposed to self-confidence and pride.

*Recognized-neglected*: this style focuses on how to manage recognition, belonging, and affect in relationships. Identity is anchored in being or not being part of relationships with those deemed estimable and can offer esteem and affective recognition. They are involved in patterns that deserve more or less attention from others. They need to be a part of others’ relationships, or they need to be apart from others to define themselves. Some people try to be very kind and lovely to make themselves worthy of receiving attention and love from others. Other people are solitary, resigned, or often angry because they are not tolerant when not seen. They find a way to actively or passively exclude themselves from relationships with others. The emotions connected with this style are happiness and joy if they are recognized, in opposition to anger and sadness if they feel neglected. Hence, being enthusiastic or pessimistic are part of this style.

## The present study

The main goal of the present paper is to define and validate the factor structure of the *Interpersonal Style Questionnaire (ISQ)* that we developed in a previous study

(Mariani et al., 2018) to operationalize the core aspects of the interpersonal styles described above. To this end, we carried out two studies. Study 1 used an Exploratory Factor Analysis approach to assess the factor structure of the ISQ. Study 2 used Structural Equation Modeling to estimate parameters and evaluate hypotheses about the ISQ Factors. Internal consistency reliability and correlations with clinical and non-clinical measures were also assessed in both studies. Accordingly, we explored the relationships between ISQ and other constructs that interface interpersonal dimensions, such as the well-known Big Five model (Goldberg et al., 2006). Also, we aim to explore the relationship between the ISQ factors and specific internalized relational patterns such as secure vs. insecure attachment styles and hyper- and hypo-mentalizing functions (Fonagy & Target, 1997; Horowitz, Rosenberg & Bartholomew, 1993). Lastly, we want to explore the relationship between ISQ factors and the four personality organizations from post-rationalism Guidano's model, such as Controller, Detached, Contextualized, and Principle-Oriented (Nardi et al. 2012).

## STUDY 1: EXPLORATORY FACTOR ANALYSIS

### Study 1: Methods

#### *Participants*

A convenience sample (e.g., undergraduate students and their relatives) was contacted by e-mail and, after a brief presentation of the questionnaire and the study aim (validation of a new instrument on interpersonal styles), they were asked to complete the questionnaires via an online platform. In total, 547 participants completed the ISQ and the *Ten Item Personality Measure (TIPI)*; see *Measures*). Females were 367 (67.1%), males were 180 (32.9%). Age varied from 18 to 74 years ( $M = 35.31$ ,  $SD = 11.86$ ). Participant education varied from junior-high-school ( $N = 21$ , 4%) to high-school ( $N = 219$ , 38%), to university degree ( $N = 317$ , 58%). The majority of participants were from Northern Italy ( $N = 342$ , 63%); the remaining participants were from Central ( $N = 167$ , 30%) or Southern Italy ( $N = 38$ , 7%). Marital status was distributed as follows: Single ( $N = 309$ , 57%), Married or Cohabiting ( $N = 210$ , 38%), Divorced or Separated ( $N = 18$ , 3%), Widowed ( $N = 10$ , 2%). The local ethical committee for psychological research approved all aspects of the study.

#### *Measures*

- *Interpersonal Style Questionnaire (ISQ)*. The questionnaire includes 85 items using a five-step Likert format from 1 (strongly disagree) to 5 (strongly agree). The items were selected from a larger set of 256 items. Item reduction was based on a preliminary exploration of the ISQ factor pattern (Mariani et al., 2018). An Exploratory Factor Analysis yielded seven orthogonal factors, and 73 content items were identified with the highest loadings on each factor. These items were retained for the final scale version. Twelve items were subsequently added to assess social desirability (i.e., #9, #19, #29, #39), tendency to lie (i.e., #8, #18, #28, #38, #47), and opposite behaviors (i.e., #10, #20, #30). These items were considered fillers in the present study, pending the completion of psychometric trials to verify their ability to capture response bias under experimental conditions. On average, completing the ISQ takes 20-30 minutes.
- *Ten Item Personality Inventory (TIPI)* (Chiorri, Bracco, Piccinno, Modafferi & Battini, 2014; Gosling, Rentfrow & Swann, 2003). It is a 10-item measure of the Big Five, or Five-Factor Model validated for an Italian population. The structure analysis and results confirmed it as a valid measure of the Big Five Personality traits: Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness. The TIPI was developed using descriptors from other well-established Big Five instruments. Each item consists of two descriptors, separated by a comma, using the standard stem: "I see myself as...". The rating scale used a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). The questionnaire showed good internal consistency and reliability in previous research (Chiorri et al., 2014).

#### *Statistical analyses*

ISQ items were submitted to Exploratory Factor Analysis of polychoric correlations using Unweighted Least Square for model fit and parameter estimation. This method has no distributional assumptions and is suited to analyze ordinal categorical items (Sellbom & Tellegen, 2019). Bartlett and Kaiser-Meyer-Olkin (KMO) tests were performed to evaluate item sampling adequacy and correlation matrix factorability. To determine a range of factor solutions to be considered for interpretation, we integrated theoretical expectations with the following decision rules: Scree-plot and Parallel Analysis (Cattell, 1966; Horn, 1965), Minimum Average Partial

(MAP; Velicer, 1976), Very Simple Structure (VSS; Revelle & Rocklin, 1979), and the Bayesian Information Criterion (BIC). Oblique Promax rotation was used for factor interpretation. All analyses were carried out using the *psych* package for R (Revelle, 2017).

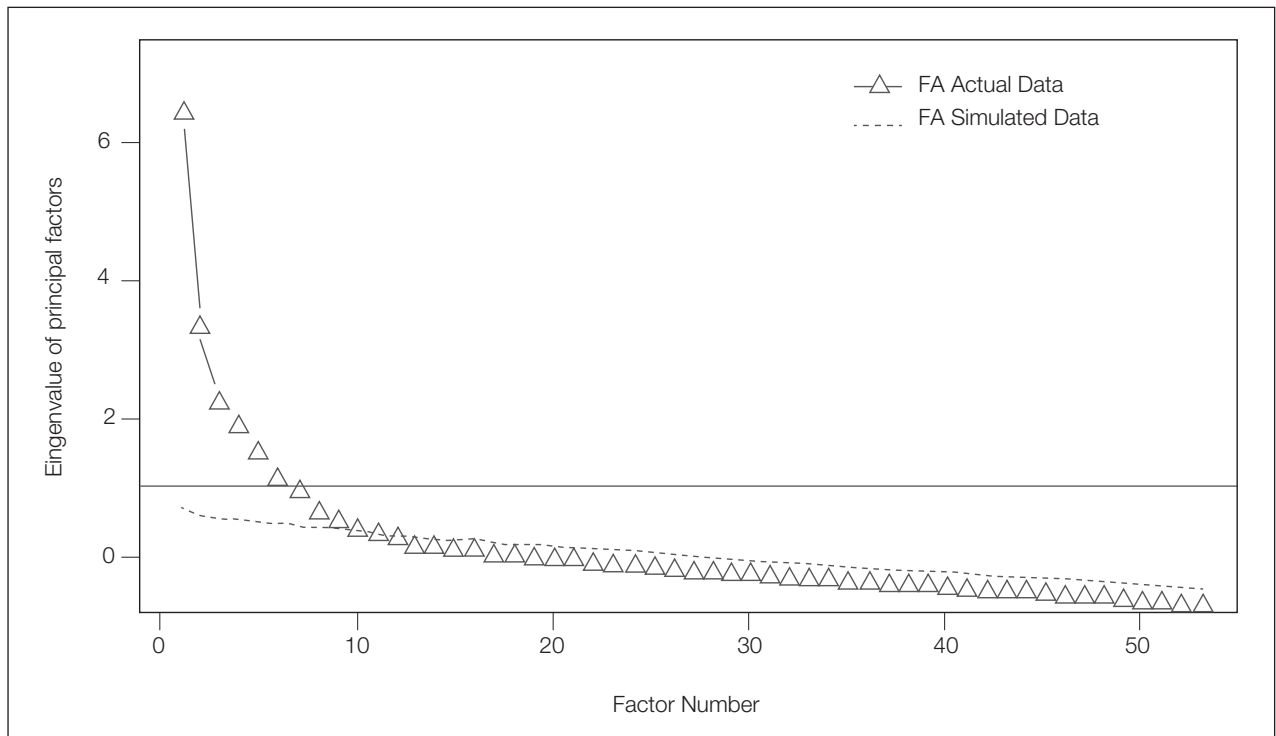
## Study 1: Results

A significant Bartlett’s test ( $\chi^2 = 17263.26$ ,  $df = 2628$ ,  $p < .001$ ) and a KMO value equal to .80 indicated that the polychoric correlation matrix was suitable for factor analysis to proceed. The VSS suggested retaining 2, 4, and 5 factors. However, the scree-plot revealed a visible elbow at the seventh eigenvalue (see Figure 1), and the BIC also achieved a minimum of -7487.23 with seven factors. The parallel analysis indicated an asymptotically flattening trend after the ninth eigenvalue, a solution supported by the MAP, which achieved a minimum of .01 with nine factors. Because

different decision rules supported either 7 or 9 factors, we considered that only seven eigenvalues greater than one were extracted, and 7 was also the number of theoretically expected factors. Seven factors were retained and obliquely rotated for interpretation.

Table 1 shows the factor pattern matrix after oblique Promax rotation. The first factor (9% of explained variance) loaded items, such as “Changing jobs makes me nervous”, “Changes worry me”, “Deciding disorients me”, “I ask for advice”, “I prefer a guide” in opposition to “I don’t get confused in worrying situations”, “I face with courage”. Worry, fear, anxiety were also common contents of this factor (items #1, #31, #40). Accordingly, this factor was labeled Dependent-Independent. The second factor (6% of explained variance) loaded items such as “Bonding’s bother me”, “I don’t like who binds”, “I do not get attached” in opposition to items like “I devote myself to those in need”, “I make myself useful”, “Investing in an emotional relationship”. This factor was labeled Withdrawn-Sociable. The third factor (5%

**Figure 1** – Parallel analysis scree plot



**Table 1** – Study 1: Standardized factor loadings from the Promax rotated factor matrix of the ISQ items

Item	Brief description of item content <sup>1</sup>	F1	F2	F3	F4	F5	F6	F7
11	changing jobs makes me nervous	.71					-.30	
1	I don't manage anxiety	.70						
21	deciding disorients me	.68						
48	changes worry me	.67						
31	I feel anxious	.67		-.23				
40	I worry	.66						
55	I ask for advice	.63						
62	I feel fragile	.59		-.23			.21	
67	I get scared	.57						
72	I delegate decisions	.58						-.25
76	I prefer a guide	.61						
81	I prefer to do things I know	.54					-.32	
85	I lose lucidity	.51						
83	I don't get confused in worrying situations	-.49	.24					
79	I face with courage	-.47			.22		.32	
2	Bonding bothers me		.55					
12	I do not like to sacrifice myself		.51		-.20			
22	I don't like who binds		.54					
32	I am not warm		.55	-.31				
41	I do not get attached		.55					
77	feelings are weaknesses		.55					
49	I devote myself to those in need		-.51		.31			
56	I seem uncaring		.46					
68	I gesture to those who are loved		.45					
73	helping makes opportunists		.45					
63	I make myself useful		-.45		.44			
80	I invest in an emotional relationship		-.42					
82	thanking is superfluous		.38		-.20			
84	to be considered a friend	.33	-.35		.21		.20	
3	I am serene			.88				
13	I am cheerful			.80				
23	I am optimistic	-.20		.69				
33	full of energy			.59				
42	I do not enjoy life		.21	-.56				
50	I feel welcomed			.45				
57	I withstand unfair criticism			-.41				
4	I keep the word				.61			
14	I keep deadlines				.61			

continued on next page

continued

Item	Brief description of item content <sup>1</sup>	F1	F2	F3	F4	F5	F6	F7
24	I am honest				.58			
43	I do not betray principles				.52			
51	I commit myself				.53			
34	I preserve correctness				.43			
58	I am consistent				.47			
64	I am not well organized	.35			-.45		.25	
74	I evaluate options				.38			
69	I am responsible				.37			
5	Being successful is important					.67		
15	I am not interested in honors					-.62		
35	I do not need to be the best					-.55		
44	I am not motivated by ambition				.25	-.54		
25	I like to decide					.53		.25
52	I am not defined by success					-.52		
65	I am a leader		-.23			.44		
60	I get what I want					.42		
70	It's meant to seek esteem		.29			-.35		
78	I'm on the side that decides					.30		
75	I reject trends					-.29		
6	I leave without plans						.66	
16	love to travel continuously						.55	
36	I am fascinated for thrill						.49	
45	new projects	-.24					.49	
59	I would like to change the world						.47	
26	I am visionary						.45	
53	I imagine and fantastic						.45	
66	I do not like to travel						-.44	
71	I do not digress in thoughts		.21	.21			-.38	
7	I don't let myself be provoked			-.21				.62
17	I answer openly							-.58
27	I am mild			-.22				.53
46	I support my point of view					-.22		-.52
37	I react aggressively							-.50
61	I do not modify myself							-.32
54	I accept commands							.35

*Legenda.* F1 = Dependent-Independent; F2 = Withdrawn-Sociable; F3 = Confident-Resigned; F4 = Responsible-Impulsive; F5 = Ambitious-Modest, F6 = Open-Stable, F7 = Gregarious-Competitive.

*Note.* <sup>1</sup> The ISQ items are available in Italian and can be requested to the corresponding author of this article.

of explained variance) loaded items such as “I am serene”, “I am cheerful”, “I am optimistic”, as opposed to “I do not enjoy life” and “I withstand unfair criticism”. This factor was labelled Confident-Resigned. The fourth factor (5% of explained variance) loaded items such as “I keep deadlines”, “I keep the word”, “I am honest”, “I do not betray principles”, “I commit myself” in opposition to “I am not organized”. This factor was labeled Responsible-Impulsive. The fifth factor (4% of explained variance) loaded items such as “Being successful is important”, “I like to decide”, “I am a leader”, as opposed to “I am not interested in honors” “I don’t need to be the best” “I am not ambitious”. This factor was labeled Ambitious-Modest. The sixth factor (4% explained variance) loaded items such as “I leave without plans”, “love to travel continuously”, “I am fascinated for thrill”, as opposed to “I do not like to travel”, “I do not digress in thoughts”. This factor was labelled Open-Stable. The seventh factor (3% explained variance) loaded items such as “I don’t let myself be provoked”, “I am mild”, “I accept commands”, as opposed to “I answer openly”, “I react aggressively”, “I support my point of view”. This factor was labelled Gregarious-Competitive.

Table 2 shows the correlations between ISQ factor-derived scales and TIPI scores. Dependent-Independent and Confident-Resigned were highly correlated with Emotional Stability and with Extraversion to a lesser extent. Responsible-Impulsive corresponded to Conscientiousness. Withdrawn-Sociable was negatively associated with Agreeableness and Extroversion as well as with Openness. Gregarious-Competitive was also linked with Agreeableness and Extroversion, but it lacked significant correlations with other TIPI scores. Similarly, Ambitious-Modest correlated significantly with Agreeableness and Extroversion, but the coefficients were smaller than those resulting for Withdrawn-Sociable and Gregarious-Competitive. Notably, Open-Stable was only weakly associated with the corresponding Openness score of the TIPI. This finding raises the question of whether the TIPI Openness score incorporated only a narrow view of the corresponding Big-Five domain or whether the Open-Stable factor of the ISQ encompassed a significant amount of non-Big-Five variance. In the subsequent study, we use a more extensive set of scales to explore the concurrent validity of ISQ factor derived scales.

**Table 2** – Study 1: correlations of IQ factors and TIPI scores (N = 245)

ISQ	TIPI				
	Extraversion	Agreeableness	Conscientiousness	Stability	Openness
Dependent–Independent	–.34**	–.07	–.29**	–.66**	.08
Withdrawn–Sociable	–.27**	–.40**	–.26**	–.08	.30**
Confident–Resigned	.49**	.30**	.32**	.62**	–.40**
Responsible–Impulsive	.09	.09	.59**	.27**	–.16*
Ambitious–Modest	.27**	–.26**	.15*	–.03	–.13*
Open–Stable	.06	–.02	–.13*	.00	.19**
Gregarious–Competitive	–.29**	.38**	–.04	.02	.08

\*\* Correlation is significant at the .01 level (two-tailed), \* correlation is significant at the .05 level (two-tailed).

## STUDY 2: CONFIRMATORY FACTOR ANALYSIS

### Study 2: Methods

#### *Participants*

Five hundred and six participants completed the ISQ and other scales for concurrent validity purposes (see *Measures*). Females were 377 (74.5%); males were 126 (24.9%). Three participants were of undisclosed gender. Age varied from 18 to 50+ years. Eighty percent of the sample was under 30 years old ( $N = 405$ ). Participant education varied from junior-high-school ( $N = 16$ , 3%) to high-school ( $N = 229$ , 45%), to university degree ( $N = 261$ , 52%). The majority of participants were from Central ( $N = 286$ , 56.5%) or Northern ( $N = 204$ , 40.3%) Italy; the remaining participants were from Southern Italy ( $N = 16$ , 3.2%). Marital status was distributed as follows: Single ( $N=376$ , 74%), Married or Cohabiting ( $N = 112$ , 22%), Divorced or Separated ( $N = 17$ , 3%). Participants' recruitment was for convenience (e.g., undergraduate students and their relatives). They were contacted by e-mail and, after a brief presentation of the questionnaire and the general study aim (i.e., validation of a new instrument about interpersonal styles). Those who agreed to participate in the study were asked to complete the ISQ via an online platform. The local ethical committee for psychological research approved all aspects of the study.

#### *Measures*

- *Interpersonal Style Questionnaire (ISQ)*. As in Study 1.
- *Ten Item Personality Inventory (TIPI)*; Gosling et al., 2003). As in Study 1.
- *International Personality Item Pool Representation of Big Five Measure (IPIP-BFM-50)*; Goldberg et al., 2006). This questionnaire was developed as part of the *International Personality Item Pool (IPIP)* project to measure the same traits as the original IPIP-NEO but with fewer items. It consists of 50 items that provide summated ratings of the canonical five factors of personality (Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness).
- *Reflective Functioning Questionnaire (RFQ)*; Fonagy et al., 2016). It is a short self-report measure of reflective functioning (i.e., the ability to understand self and others' mental states) that is presumed to capture individual

differences in hypo and hyper-mentalizing recently validated in Italian (Morandotti et al., 2018). RFQ comprises two 8-item scales measuring the perceived degree of uncertainty and certainty about mental states, respectively. Items are scored on a 7-point Likert scale (ranging from “completely disagree” to “completely agree”). Two scores can be obtained from the RFQ: the certainty and the uncertainty scales. High levels of certainty about mental states are assumed to reflect hyper-mentalizing, and high levels of uncertainty are assumed to reflect hypo-mentalizing.

- *Relationship Questionnaire (RQ)*; Bartholomew & Horowitz, 1991). This is a five-item questionnaire used to evaluate adult attachment styles. The first item asks participants to read four sentences (each describing a prototypical attachment style) and indicate how well they described them, giving a categorical variable that indicated the prevalent attachment style. The RQ was designed to obtain continuous ratings of each of the four attachment patterns. The following items ask to rate on a seven-point scale the degree to which each style pertains to them where a score of 1 is ‘not at all like me’, a score of 4 is ‘neutral/mixed’ and a score of 7 is ‘very much like me’. The RQ generates two scores for the prevalent pattern relationship. Higher scores on the Anxiety/Self Model indicate higher anxiety and more negative models of self; higher scores on the Avoidance/Other Model describe higher avoidance and more negative models of the other. Lower scores on both models suggest a secure and adaptive pattern relationship.
- *Mini Questionnaire of Personal Organization (MQPO)*; Nardi et al., 2012). This questionnaire has been constructed in order to comply with the inward/outward Personal Meaning Organization's (PMO) theory. According to Nardi's adaptive post-rationalist approach, predictable and invariable caregivers' behaviours allow inward focus and a physical sight of reciprocity; non-predictable and variable caregivers' behaviours allow outward focus and a semantic sight of reciprocity. MQPO is composed of 20 items, scored on a five-step Likert scale from 1 (extremely false) to 5 (extremely true). Four different factors have been found in previous research: Controller is a stable personality where separation from the caregiver and environmental exploration is possible when the subject feels the situation is under control and sure. Detached is constructed to assess detachment and loneliness that the subject perceives as the habitual condition of their life-



span, trying to find the necessary resources to realize themselves. Contextualized gives relevant importance to comparison with others, to the results achieved, and to the adaptive research of people, situations, and activities, which enables the person to draw the better self-esteem possible. Principle-Oriented consists in evaluating the world according to his/her values; high scorers appear consenting to instructions and rules, but they are also looking for a new and original theories on life, concerning the significance of skills, relations, and goals.

### Statistical analyses

An Exploratory Structural Equation Modeling (ESEM) analysis was conducted using M-plus (Version 8.4). Consistent with Study 1, we fitted the Polychoric correlation matrix using Weighted Least Squares estimators (WLSMV). Seven oblique factors were specified, each corresponding to one of the ISQ factors. To cross-validate and confirm the factor structure emerging from Study 1, we used an oblique target rotation, in which the items were forced to load the most on the corresponding factor (e.g., Dependent-Independent items on the Dependent-Independent factor). Cross-loadings were targeted to be as close to zero as possible. The WLSM  $\chi^2$  and other descriptive indices were used to evaluate the model's fit. Both CFI and TLI greater than .95 indicate a good fit, while values greater than .90 are deemed acceptable. Good fit corresponds to an RMSEA of .06 or less, while values of .08 are acceptable. A cut-off value of .08 for the SRMR supports a good fit between the model and the data.

## Study 2: Results

Although the seven-factor model yielded a significant chi-square ( $\chi^2 = 3584.62$ ;  $df = 2138$ ;  $p = .000$ ), the RMSEA was excellent and achieved the close-fit (Estimate = .037, 90% CI = .034-.039,  $p$ -close = 1.000). The CFI = .896 approached the conventional standard of acceptable fit; the TLI = .873 was insufficient. According to Kenny, Kaniskan and McCoach (2015), the CFI and TLI might not be very informative when the baseline model's RMSEA is <.158. In the specific case, the baseline RMSEA = .102 was lower than the threshold mentioned above. Therefore, we appraised the fit of the seven-factor model as overall acceptable.

As shown in Table 3, the model yielded fairly defined factors. All items significantly loaded on the hypothesized

factor. This was what we have found for Dependent-Independent ( $|\lambda| = .48$ -.69,  $M_{|\lambda|} = .60$ ), Withdrawn-Sociable ( $|\lambda| = .36$ -.63,  $M_{|\lambda|} = .50$ ), Confident-Resigned ( $|\lambda| = .31$ -.73,  $M_{|\lambda|} = .55$ ), Ambitious-Modest ( $|\lambda| = .30$ -.61,  $M_{|\lambda|} = .45$ ), Responsible-Impulsive ( $|\lambda| = .48$ -.68,  $M_{|\lambda|} = .56$ ), Open-Stable ( $|\lambda| = .38$ -.70,  $M_{|\lambda|} = .50$ ), and Gregarious-Competitive ( $|\lambda| = .38$ -.70,  $M_{|\lambda|} = .50$ ). Although the model resulted in several statistically significant cross-loadings, all items had target loadings greater than cross-loadings, except item #57 of the Confident-Resigned factor. Only in 29% of cases, the cross-loadings exceeded .19 (see underlined  $\lambda$ -s in Table 3), and only sporadically they were larger than .40 (see items #81 and #63). In no other case were cross-loadings high enough to threaten item validity and good factor definition.

To assess whether ISQ items measured the hypothesized latent factor with sufficient precision, we assessed the proportion of variance in the latent factor explained by its indicators, called factor replicability. The following indices were obtained: Dependent-Independent ( $H = .91$ ), Withdrawn-Sociable ( $H = .86$ ), Confident-Resigned ( $H = .84$ ), Responsible-Impulsive ( $H = .87$ ), Ambitious-Modest ( $H = .80$ ), Open-Stable ( $H = .82$ ), and Gregarious-Competitive ( $H = .87$ ). All ISQ factors met with the standard of replicability (i.e.,  $H > .80$ ; Hancock & Mueller, 2001). Because we will use factor scores in subsequent validity analyses, we also evaluated the factor score determinacy (FD). FD represents the correlation between factor scores and the latent variables in the model. It is strongly advised that FD be  $> .90$  to use factor score estimates as proxies of latent factors. The following indices were obtained: Dependent-Independent (FD = .95), Withdrawn-Sociable (FD = .92), Confident-Resigned (FD = .91), Ambitious-Modest (FD = .88), Responsible-Impulsive (FD = .92), Open-Stable (FD = .90), and Gregarious-Competitive (FD = .87). These results are overall satisfactory but recommend caution when interpreting Ambitious-Modest and Gregarious-Competitive scores.

To study the concurrent validity of the ISQ, we correlated the factor scores emerging from previous analyses with the TIPI and IPIP Big-Five questionnaires, the RFQ and RQ questionnaires, and the MQPO (see Table 4). We found high correlations of the Dependent-Independent factor with emotional stability (negatively) and neuroticism (positively). We also observe from Table 4 that this factor is also positively correlated with an anxious attachment style and negatively correlated with the hyper-mentalization/certainty about mental states score of the RFQ. Last, the

**Table 3** – Study 2: standardized factor loadings from the Seven-Factor Exploratory Structural Equation Modeling target rotation of the ISQ

Item	Dependent-Independent	Withdrawn-Sociable	Confident-Resigned	Responsible-Impulsive	Ambitious-Modest	Open-Stable	Gregarious-Competitive
31	.69 (.000)	-.09 -(0.002)	<u>-.39</u> (.000)	.07 -(0.020)	.11 (.000)		.15 (.000)
21	.68 (.000)			-.16 (.000)			-.18 (.000)
48	.68 (.000)		-.07 -(0.030)	<u>.21</u> (.000)		<u>-.23</u> (.000)	
55	.67 (.000)	-.06 -(0.101)	.16 (.000)	-.14 (.000)	-.13 (.000)	.13 -(0.001)	<u>-.24</u> (.000)
1	.66 (.000)	-.11 -(0.001)	<u>-.29</u> (.000)		.13 (.000)		<u>.21</u> (.000)
72	.66 (.000)	.10 -(0.004)	.12 -(0.001)	-.12 -(0.001)			-.08 -(0.032)
85	.62 (.000)		-.07 -(0.041)	-.15 (.000)			.11 -(0.007)
76	.60 (.000)		<u>.20</u> (.000)		-.11 -(0.002)		<u>-.27</u> (.000)
11	.59 (.000)	.07 -(0.048)	.11 -(0.004)	.18 (.000)	.12 -(0.001)	<u>-.27</u> (.000)	
67	.58 (.000)	-.10 -(0.011)		-.14 (.000)			-.09 -(0.028)
62	.58 (.000)		<u>-.29</u> (.000)			.19 (.000)	.08 -(0.028)
81	.56 (.000)	.10 -(0.008)	<u>.21</u> (.000)	.07 -(0.044)		<u>-.42</u> (.000)	
40	.48 (.000)		<u>-.20</u> (.000)	<u>.24</u> (.000)			
83	-.48 (.000)	<u>.20</u> (.000)	<u>.24</u> (.000)	.19 (.000)			
79	-.51 (.000)		<u>.23</u> (.000)	.15 (.000)	-.08 -(0.017)	<u>.28</u> (.000)	.10 -(0.010)
77		.63 (.000)			-.10 -(0.014)	.10 -(0.015)	
22		.59 (.000)		.14 -(0.001)		.13 -(0.001)	-.11 -(0.012)
41		.59 (.000)		.12 -(0.002)		.09 -(0.025)	
2	.14 (.000)	.55 (.000)		.17 (.000)		.10 -(0.008)	.14 -(0.001)
32	.16 (.000)	.52 (.000)	<u>-.22</u> (.000)	.08 -(0.029)			-.13 -(0.001)
56		.45 (.000)	.10 -(0.024)	<u>-.23</u> (.000)		<u>.20</u> (.000)	.12 -(0.004)
73	.13 -(0.001)	.41 (.000)			-.09 -(0.024)		
12		.40 (.000)	.10 -(0.026)	<u>-.28</u> (.000)		-.18 (.000)	
68		.40 (.000)		.14 -(0.001)	.12 -(0.006)		<u>.23</u> (.000)
82		.40 (.000)		-.16 -(0.001)			.14 -(0.021)
84	<u>.39</u> (.000)	-.36 (.000)	.11 -(0.025)		<u>-.31</u> (.000)	.10 -(0.033)	
80	.09 -(0.029)	-.51 (.000)	<u>.22</u> (.000)				.15 -(0.002)
63	<u>.26</u> (.000)	-.58 (.000)	.16 (.000)	<u>.40</u> (.000)	.10 -(0.024)	<u>.40</u> (.000)	
49	<u>.30</u> (.000)	-.59 (.000)	.11 -(0.014)	<u>.31</u> (.000)		<u>.31</u> (.000)	
3		-.19 (.000)	<u>.73</u> (.000)		-.09 -(0.004)		
23	<u>-.22</u> (.000)	-.06 -(0.029)	<u>.69</u> (.000)				-.07 -(0.044)
13	-.13 (.000)		<u>.66</u> (.000)	-.14 (.000)			
50	-.11 -(0.004)	<u>-.24</u> (.000)	<u>.48</u> (.000)			-.09 -(0.015)	
33	<u>-.29</u> (.000)	-.10 -(0.003)	<u>.47</u> (.000)		-.13 (.000)		
57			<u>.31</u> (.000)	.11 -(0.005)	<u>.26</u> (.000)	.13 (.000)	<u>-.46</u> (.000)

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continued

Item	Dependent- Independent	Withdrawn- Sociable	Confident- Resigned	Responsible- Impulsive	Ambitious- Modest	Open- Stable	Gregarious- Competitive
42	<u>.35</u> (.000)	<u>.29</u> (.000)	<u>-.51</u> (.000)	.09 $-(.013)$		.10 $-(.004)$	
14				<u>.68</u> (.000)	-.18 (.000)	<u>-.22</u> (.000)	-.14 $-(.001)$
24	-.10 $-(.016)$	-.16 (.000)		<u>.66</u> (.000)	-.13 (.000)		
4		-.09 $-(.034)$	.10 $-(.009)$	<u>.65</u> (.000)			.09 $-(.025)$
58	-.13 $-(.003)$			<u>.54</u> (.000)			
69	.16 (.000)		<u>-.24</u> (.000)	<u>.54</u> (.000)		.09 $-(.032)$	
51	-.11 $-(.003)$	-.12 $-(.005)$		<u>.53</u> (.000)	-.14 (.000)		
43	-.08 $-(.048)$			<u>.52</u> (.000)	.13 $-(.001)$		
74	.12 $-(.007)$			<u>.49</u> (.000)	-.11 $-(.013)$		
34	.09 $-(.029)$			<u>.48</u> (.000)		.12 $-(.002)$	.15 $-(.001)$
64	<u>.28</u> (.000)	.15 (.000)	.13 $-(.003)$	<u>-.48</u> (.000)	.17 (.000)	<u>.35</u> (.000)	
15					<u>.55</u> (.000)		.10 $-(.016)$
35		-.13 $-(.003)$	.10 $-(.015)$		<u>.55</u> (.000)		
52		-.15 (.000)	.14 $-(.001)$		<u>.51</u> (.000)		.15 $-(.001)$
44	.12 $-(.003)$	.08 $-(.038)$	.17 (.000)		<u>.45</u> (.000)		
70		.16 (.000)		<u>.25</u> (.000)	<u>.35</u> (.000)	.10 $-(.017)$	.18 (.000)
75		.18 (.000)		<u>.21</u> (.000)	<u>.30</u> (.000)	.11 $-(.011)$	.10 $-(.028)$
60		.11 $-(.007)$	<u>.24</u> (.000)		<u>-.31</u> (.000)	.15 (.000)	<u>.29</u> (.000)
65	.10 $-(.013)$	<u>-.21</u> (.000)	<u>.20</u> (.000)	<u>.25</u> (.000)	<u>-.39</u> (.000)	.12 $-(.005)$	.18 (.000)
78		.18 (.000)	.16 (.000)		<u>-.42</u> (.000)		<u>.24</u> (.000)
25	-.13 (.000)	.06 $-(.072)$	.15 (.000)		<u>-.50</u> (.000)	.11 $-(.004)$	<u>.39</u> (.000)
5				<u>.36</u> (.000)	<u>-.61</u> (.000)		
6	-.07 $-(.050)$			-.12 (.000)		<u>.70</u> (.000)	
16	-.08 $-(.029)$	.13 (.000)	-.15 (.000)			<u>.64</u> (.000)	-.10 $-(.009)$
36		.10 $-(.009)$		-.12 $-(.001)$		<u>.49</u> (.000)	
45	<u>-.39</u> (.000)	-.11 $-(.001)$		.15 (.000)	-.15 (.000)	<u>.48</u> (.000)	.10 $-(.014)$
59	-.16 (.000)	.15 $-(.001)$				<u>.46</u> (.000)	
53	.09 $-(.037)$	<u>-.24</u> (.000)	.16 (.000)	-.19 (.000)	.15 $-(.001)$	<u>.42</u> (.000)	.16 $-(.001)$
26			<u>.22</u> (.000)	.13 $-(.003)$	-.16 (.000)	<u>.40</u> (.000)	.12 $-(.010)$
71	-.11 $-(.018)$	<u>.30</u> (.000)		<u>.20</u> (.000)		<u>-.38</u> (.000)	
66	.19 (.000)	.11 $-(.012)$	<u>.25</u> (.000)		<u>.21</u> (.000)	<u>-.51</u> (.000)	<u>.21</u> (.000)
17	-.11 $-(.003)$	.10 $-(.004)$				.11 $-(.001)$	<u>.61</u> (.000)
46	-.13 $-(.001)$			.12 $-(.003)$	-.09 $-(.012)$		<u>.57</u> (.000)
37	<u>.22</u> (.000)	<u>.21</u> (.000)	.11 $-(.010)$	.16 (.000)	<u>-.27</u> (.000)		<u>.39</u> (.000)
61	-.12 $-(.006)$	<u>.25</u> (.000)		<u>.26</u> (.000)	.16 (.000)		<u>.27</u> (.000)
7		.14 $-(.001)$	<u>.33</u> (.000)	.18 (.000)	.15 (.000)		<u>-.38</u> (.000)
54	.15 (.000)		<u>.24</u> (.000)	.18 (.000)			<u>-.40</u> (.000)
27			<u>.23</u> (.000)	.19 (.000)	<u>.22</u> (.000)	.12 $-(.001)$	<u>-.54</u> (.000)

**Table 4** – Study 2: correlations of ISQ factors and TIPI scores

	Dependent- Independent	Withdrawn- Sociable	Confident- Resigned	Responsible- Impulsive	Ambitious- Modest	Open-Stable	Gregarious- Competitive
TIPI <sup>1</sup>							
Extraversion	-.18**	-.15*	.29**	-.18**	.22**	.18**	-.25**
Agreeableness	-.12*	-.43**	.29**	.19**	-.17**	-.01	.44**
Conscientiousness	-.35**	-.19**	.19**	.59**	.14*	-.16**	.03
Stability	-.72**	-.22**	.58**	.10	.01	.08	.16**
Openness	-.02	.08	-.16**	.09	-.19**	.18**	.08
IPIP <sup>2</sup>							
Extraversion	-.47**	-.28**	.61**	.04	.32**	.22**	-.20**
Agreeableness	.00	-.50**	.27**	.11*	-.19**	-.03	.45**
Conscientiousness	-.38**	-.28**	.36**	.61**	.21**	-.08	-.14*
Neuroticism	.70**	.24**	-.73**	-.12*	-.09	-.12*	-.14*
Openness	-.01	-.24**	.03	.05	.02	.37**	.05
RFQ <sup>3</sup>							
Certainty	-.32**	-.09	.12	.13	.11	-.04	-.05
Uncertainty	.09	.10	-.05	.03	-.10	.04	-.20**
RQ <sup>3</sup>							
Anxious/Self Model	.48**	.09	-.51**	-.08	-.05	-.08	.03
Avoidant/Other Model	.06	.42**	-.27**	.12	.03	.02	-.08
MQPO <sup>3</sup>							
Contextualized	.52**	-.05	-.21**	-.06	.17*	-.07	.01
Detached	.28**	.34**	-.47**	.00	-.10	.11	-.12
Controller	.28**	.19**	-.11	.08	.03	-.12	-.10
Principle-Oriented	-.21**	.17*	.21**	.30**	.04	.18*	-.26**

\*\* Correlation is significant at the .01 level (two-tailed); \* correlation is significant at the .05 level (two-tailed).

Note. 1  $N = 303$ ; 2  $N = 323$ ; 3  $N = 203$ .

**Table 5** – Study 2: descriptive statistics of ISQ factors and tests of gender differences

ISQ Factor (score range)	Total Sample <sup>1</sup>		Females <sup>2</sup>		Males <sup>3</sup>		Gender differences		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>t</i> -test	<i>p</i>	Cohen's <i>d</i>
Dependent–Independent(17–75)	46.1	11.31	47.2	10.85	42.6	11.93	4.06	<.001	.42
Withdrawn–Sociable (14–51)	29.7	7.55	28.9	7.5	31.9	7.33	–3.94	<.001	–.41
Confident–Resigned (7–34)	22.1	5.08	22	5.09	22.4	4.99	–.80	.423	–.08
Responsabile–Impulsive (12–50)	40.7	5.51	41.2	5.38	39.4	5.63	3.23	<.001	.33
Ambitious–Modest (14–50)	34.6	6.23	34.7	5.94	34.2	6.94	.86	.392	.09
Open–Stable (14–45)	31.4	5.89	30.9	5.81	33	5.89	–3.58	<.001	–.37
Gregarious–Competitive (7–32)	18.6	4.47	18.4	4.43	19.2	4.53	–1.80	.072	–.19

Note. <sup>1</sup> *N* = 506; <sup>2</sup> *N* = 377; <sup>3</sup> *N* = 126.

Dependent-Independent factor was positively associated with all the dysfunctional relational styles of the MQPO, particularly with the contextualized style, which describes a person focusing on external context looking for approval and disapproval. Taken together, the underlying construct of Dependent-Independent turns out to be a fundamentally neurotic aspect of personality.

The Responsible-Impulsive was associated with Conscientiousness scores of the TIPI and IPIP scales. There was no evidence that this factor was linked with attachment style, reflective function, or dysfunctional relationship styles. However, it was observed that greater accountability was associated with a Principle-Oriented relational style, which is related to self-commitment, evaluating one's behavior according to one's values and rules, not to results.

Negative correlations characterized the Withdrawn-Sociable factor with both TIPI and IPIP Agreeableness and positive correlations with the avoidant attachment style and Detached relational style, which is described as related to managing loneliness that the subject perceives as the habitual condition of own life. This factor also reflects an intricate relational style, defined by an unfriendly attitude toward

others and deeply distrustful relationships. The data reported in Table 4 indicated that the Confident-Resigned factor had moderately high correlations with TIPI emotional stability (positively) and IPIP neuroticism (negatively) as well as moderate negative correlations with anxious and avoidant attachment styles, and all the dysfunctional relational styles of the MQPO and a positive correlation to Principle-Oriented. Basically, Confident-Resigned represents a functional personality factor, almost the mirror image of what has been observed for the Dependency-Independence factor.

Regarding the Open-Stable factor, the previous study suggested that this might include a significant non-Big-Five variance given the low correlation with the corresponding Openness TIPI score. Using the IPIP questionnaire as the Big-Five marker in Study 2, we observed that the Open-Stable factor continued to be weakly correlated with TIPI scores. However, the correlations with the Openness factor of the IPIP questionnaire were higher. Indeed, these results indicated that low correlations observed in both studies could be due to the different measurements of Openness in the TIPI and the IPIP, in the former case as intellect and the latter as Openness to new experiences. No other theoretically relevant

correlations were found for Open-Stable with attachment measures or relational styles. The Ambitious-Modest factor was linked with extraversion and conscientiousness, while no other noteworthy correlations were found with non-Big-Five concurrent validity criteria.

The Gregarious-Competitive factor was moderately correlated with Agreeableness and to some extent with a normative relational style and negatively correlated with the uncertainty about mental states score of the RFQ.

Because gender differences can be relevant variables in structuring an interpersonal style, we carried out a descriptive analysis of ISQ factor scores by gender (see Table 5). Four out of seven tests of gender differences turned out to be statistically significant. Females described themselves in interpersonal relationships as significantly more dependent, responsible, sociable, and seeking stability than males did.

## DISCUSSION

The present study investigated the factor structure and concurrent validity of the ISQ, a new questionnaire for assessing the interpersonal manifestations of personality according to clinical theories (Carli & Paniccia, 2003; Guidano, 1987, 1991; Ugazio, 1998, 2013). We found seven empirically robust factors across two independent studies, involving over 1000 participants and using both exploratory and confirmatory analyses. Besides sound factor structure and good model fit, the interpretation of the seven factors based on item content is consistent with the set of individual differences in broad personality traits and clinical constructs assessed in the present study.

The first factor, Dependent-Independent, was associated with neuroticism and emotional stability (negatively), anxious attachment, contextualized personal meaning organization, and certainty about feelings and mental states (negatively). Thus, individuals scoring high on this factor are prone to doubting their own and others' feelings and mental states (Bornstein, 1992). In contrast, people scoring low are more confident in their reflections and inferences. Previous research has shown that RFQ certainty is less associated with psychopathology, particularly in non-clinical groups (Müller et al. 2020; Spitzer et al., 2021). Collectively, these results support our interpretation of Dependent-Independent as inherently linked with experiencing psychological distress, feeling uncertain about the availability of attachment figures,

and doubting one's self-worth. The second factor, Withdrawn-Sociable, was negatively associated with Agreeableness and positively with an Avoidant/Other model and a Detached personal meaning organization. We interpreted these correlations as evidence that the Withdrawn-Sociable factor reflects a structured negative view of others and a tendency to disengage from interpersonal relations. Almost a perfect mirror image of Dependent-Independent in terms of relations with criteria instruments, the third factor, Confident-Resigned, was characterized by marked extroversion and emotional stability. Considering the negative correlations of this factor with Anxious and Avoidant models, it also seems likely that Confident-Resigned is intertwined with a secure attachment style and the ability to develop and foster meaningful emotional bonds (Marshall et al., 1992). In sum, the first three ISQ factors seem to reflect the three attachment styles that influence adult preference for establishing emotional bonds with other people (e.g., Shaver and Mikulincer, 2005).

The fourth factor, Responsible-Impulsive, was strongly tied to Conscientiousness, reflecting fairness and honesty towards others, focusing on one's ideals and rules. Although these personality characteristics are not specifically interpersonal, they might predispose the individual to maintain adaptive social behaviors. For example, conscientious adolescents have been found to have better quality friendships and greater peer acceptance (Jensen-Campbell & Malcolm, 2007). If confirmed in adulthood, these findings suggest that the ISQ's Responsible-Impulsive factor - like conscientiousness - might predict important life outcomes (e.g., academic & job performance, longevity) and promote adaptive behaviors in social situations.

The fifth factor, Ambitious-Modest, was only moderately correlated with Extroversion and rather weakly correlated with the other variables used as criteria in the present study. This factor resonates with the HEXACO Honesty-Humility factor (Lee & Ashton, 2004). Indeed, Humility - like Modesty - characterizes individuals who do not believe they are entitled to higher social status. In contrast, Ambition mirrors a tendency to feel a strong sense of self-importance, which is just the opposite of Humility. Despite the relevance of desire for job success, personality assessment has overlooked the construct of Ambition (e.g., it appears only in the *Hogan Personality Inventory*). No personality trait taxonomy views ambition as a unitary construct. For example, Ambition is spread across Neuroticism, Extroversion, and

Conscientiousness, both in the Big-Five and HEXACO models (Jones, Sherman & Hogan, 2017). Thus, the fifth ISQ factor has the potential to provide a direct assessment of this job-related trait, also in opposition to modesty.

Regarding the sixth factor, Open-Stable, the two studies revealed only low-moderate correlations with the criteria instruments. What seems to emerge quite clearly is that this factor is to some extent associated with the Openness trait of the Big Five. However, it is still believed today that Openness is a complex personality characteristic with at least two separable but linked aspects (DeYoung, Quilty & Peterson, 2007). On the one hand, openness to new experiences reflects the broadness of cultural interests and tolerance of different values, people, habits, and lifestyles; on the other hand, intellect reflects intellectual curiosity, creativity, and quick thinking. The low correlations of ISQ Open-Stable with the TIPI openness score may be due to the measurement of this trait as intellect, whereas the larger - but still moderate - correlation with the IPIP reflects the broader definition of the trait in terms of Openness to culture and new experiences. Indeed, the ISQ dimension captures a concept of Openness to experience, and thus change, rather than a more cognitive and thinking dimension.

The last factor retrieved in our study was Gregarious-Competitive. According to McCrae and Costa (2003), Gregariousness is one of the facets of Extraversion. However, in our research, we found mild negative correlations between Gregarious-Competitive and Extroversion. Instead, the largest correlation was with Agreeableness. This finding underscores the interpretation of the ISQ factor in terms of the desire to stay connected to others, being pleasant and friendly. Interestingly, high scores on Gregarious-Competitive were negatively associated with RFQ uncertainty. Therefore, competitive individuals tended to lack understanding of mental states and the ability to mentalize.

The seven factors accounted for 37% of the total variance in EFA. According to Peterson (2000), there is no gold standard for what constitutes an acceptable level of variance. However, the same study stated that the average percentage in social science studies was 56.6%. In this sense, our findings are undoubtedly suboptimal compared to this average value. However, Peterson (2000) also showed that the variance explained in EFA decays significantly as the number of items in the analysis increases. An exploratory factor analysis with up to 10 variables accounts for 63.2%, whereas the same analysis with 31 or more variables accounts for 48.1%

(Peterson, 2000). Our results align with this downward trend, considering that we analyzed more than twice as many variables as the upper bound reported by Peterson (2000). For instance, item-level analyses of well-established 60-item personality scales like the NEO-FFI or the HEXACO accounted for approximately 35% and 37% of the total variance, respectively (Ashton & Lee, 2009; Manga, Ramos & Morán, 2004). Considering this evidence, we can reassess our findings to align with what commonly emerges in similar studies of personality questionnaires.

It is worth noting that the variance explained in EFA is not the only criterion for assessing the empirical robustness of the factors. First, the EFA solution was cross-validated using an independent sample and a cutting-edge structural equation modeling approach. Second, the ISQ items measured the latent factor with sufficient precision. According to Hancock and Mueller (2001), well-defined latent variables have a construct replicability H index greater than .80, a value attained by all ISQ factors in Study 2. Of course, a future revision of the ISQ could develop a more balanced form, reducing the overabundant items that measure the first three factors and reinforcing the factors that explain the smaller portions of variance, which have shown acceptable reliability and validity in this study.

Gender differences are relevant variables in interpersonal behavior. Accordingly, our study found substantial gender differences in four of the ISQ's seven factors, with women describing themselves as more dependent, responsible, sociable, and seeking stability than men. These results are consistent with the literature, which highlights that women score higher in kindness, responsibility, and neuroticism than men (Fortes-Vilaltella, Oriol, Filella, Del Arco & Soldevila, 2013; Fuertes et al., 2020; Rubinstein, 2005). Men and women's basic personality traits appear to differ in various ways. For example, gender differences in negative emotionality characteristics (e.g., neuroticism, anxiety, depression, and rumination) have been documented in systematic reviews (Ellis, 2011; Hyde, 2014; Russo & Green, 1993; Schmitt et al., 2017), formal meta-analyses (De Bolle et al., 2015; Johnson & Whisman, 2013) and large cross-sectional studies (Bodas & Ollendick, 2005; Hopcroft & McLaughlin, 2012; Lippa, 2005).

It is worth recalling that the ISQ was devised to operationalize the four interpersonal styles described by three clinical theories (Carli & Paniccia, 2003; Guidano, 1982; Ugazio, 1998, 2012). A relevant theoretical question, thus, is how to link the seven empirical factors retrieved in the study

to each style of the theoretical framework that inspired the development of the ISQ.

Dependent-Independent and Open-Stable fit well with the description of the free-dependent style because they fall within the matrix of meanings generated by the prevailing emotions of fear and courage. The first factor reveals more the anxiety connected to the feeling of needing or not needing the affective closeness of the other, while the second factor highlights the resourcefulness of those who do not yield to the call of emotional and friendship ties and feel attracted towards new explorations or, on the contrary, feel the need for stable contexts.

Ambitious-Modest and Gregarious-Competitive are similar to the defining characteristics of the winner-loser style, where the emotions experienced by these people are pride and a sense of personal efficacy or embarrassment and shame. Therefore, the first factor detects the salience for these people of power and competitive dynamics, and the second factor focuses on the relational modes involved in achieving the different power positions that can be assumed in relationships.

Withdrawn-Sociable and Confident-Resigned are compatible with the recognized-neglected style. Joy and happiness, when one is welcomed and recognized, and sadness and anger, when one feels neglected and excluded, are the typical and central emotions of the subjects with this style. The two ISQ factors reveal both the relational strategies of withdrawing from the relationship or seeking affection and attention, and the motivations underlying these strategies, i.e., resignation and anger at not receiving the proper consideration of others or the confidence that it is possible to obtain it by making oneself worthy of it in various ways.

Regarding the Responsible-Transgressive theoretical style, we found the Responsible-Impulsive factor that seems to cover its contents partially. The matrix of meanings generated by the emotions of guilt and innocence mainly concerns two dimensions: the correctness or not towards others, rules and duties, and sacrificing one's own needs in favor of those of others, or, on the contrary, privileging one's own. The factor found in the ISQ covers the first aspect linked to guilt and the moral dimension of doing well and respecting others and the rules, resulting in feeling good and correct. The dimension of sacrifice or transgression and selfishness has not emerged in our previous study (Mariani et al., 2018). Likewise, these aspects have not been found in the present one. Future research should attempt to recover this missing content.

Our studies have some notable limitations that can guide future research. To begin with, the ISQ interpersonal styles cover only a small number of the many aspects of interpersonal interactions. Therefore, they do not reflect all possible interpersonal styles. For a thorough assessment of interpersonal functioning, additional tools are required. However, according to our clinical experience, the ISQ styles are the most likely to be involved in normal and problematic interpersonal relationships. Second, the tools we employed to assess the concurrent validity of ISQ factors did not fully establish whether the ISQ styles merely relate to individual personality characteristics or evaluate components of personality that are effectively involved in interpersonal contexts. Other measures that examine interpersonal connections directly might give further information in this area. Especially if used in the clinical setting, ISQ could receive robust confirmation of the hypothesis that interpersonal styles are prevalent in people with the more frequent mental disorders and that the reference theories assume are extreme manifestations of the four interpersonal styles described. Third, future ISQ studies might use observational methods to address the limits of self-report methodology, which is more suited to detecting individual subjective impressions than relational functioning in its complexity. Last, the samples used in both studies are unbalanced by gender and age, with a prevalence of young female participants. Because we employed a convenience sample, the proportion of young female participants who answered the call was higher. The higher engagement of young women in psychological research has been well documented in the literature (Moore & Tarnai, 2002; Porter & Whitcomb, 2005), and this might influence answers to interpersonal questions. Considering the well-established differences in interpersonal behaviors between males and females (Schmitt et al., 2017), we believe this finding adds to the validity of the ISQ. This is not to say that a well-balanced representative sample is not required to refine the ISQ and standardize it for personality assessment applications. Notwithstanding these limitations, ISQ is a promising new tool that allows researchers and clinicians to investigate the relational styles described as more frequent and prototypical by three converging theoretical perspectives (Carli & Panizza, 2003; Guidano, 1987, 1991; Ugazio, 1998, 2012) regarding the relationship between human beings and their interpersonal contexts.

**Conflict of interests.** The authors declare that there is no conflict of interest. All authors have contributed equally.



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# Cognitive rehabilitation in subjects suffering from environmental diseases

Giuseppe Castellani<sup>1, 2, 3</sup>, Luca Mandolesi<sup>4</sup>

<sup>1</sup> Scuola di Specializzazione in Psicoterapia “Erich Fromm”, Prato, Italy

<sup>2</sup> Direttore CentroRARE- Danni Neurocognitivi da Malattie Ambientali, Polo Psicodinamiche, Prato, Italy

<sup>3</sup> CTU Tribunale di Firenze, Italy

<sup>4</sup> Ricerca e sviluppo - Giunti Psychometrics, Firenze, Italy

prof.castellani@gmail.com

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✎ **ABSTRACT.** Dopo una breve introduzione sui meccanismi eziologici coinvolti nello sviluppo di alcune malattie ambientali quali la sensibilità chimica multipla, la fibromialgia, la sindrome da fatica cronica e l'elettrosensibilità, in questo articolo vengono presentati i risultati di un training di riabilitazione cognitiva effettuato su un gruppo eterogeneo di 25 soggetti affetti da tali malattie. La perdita di capacità di memoria, attenzione e concentrazione sono le principali conseguenze sul piano cognitivo di queste sindromi, ancora poco conosciute nonostante siano studiate dagli anni Cinquanta. Dopo un periodo di circa tre settimane, consistente nella somministrazione di esercizi atti a stimolare le aree neurali interessate, si sono ottenuti complessivi miglioramenti in tutti i soggetti nelle capacità in questione. I miglioramenti realizzati vanno poi stabilizzati mediante programmi di mantenimento appositamente costruiti.

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✎ **SUMMARY.** *There is a lack of studies about environmental diseases, such as multiple chemical sensitivity, fibromyalgia, chronic fatigue syndrome and electrosensitivity. The main cognitive consequences of these syndromes are the loss of memory, attention and concentration. The aim of the study is to experimentally verify the impact of cognitive rehabilitation on these aspects in people suffering from these diseases. Two phases of training for memory were administered to an experimental group of 25 subjects suffering from environmental diseases and to a control group made up of 12 healthy people. Subsequently they were administered again in order to evaluate a possible improvement of the neuropsychological functions. The training shows in both groups a general improvement in memory. The improvement is more considerable in people suffering from the diseases, probably because of the lower starting level of the patients. People suffering from environmental diseases can improve their cognitive functions through a rehabilitation training of memory, like the one presented in this study. These functions are essential to let people to have a regular everyday life. There is a need for more studies in order to find the best neuropsychological therapy, to help people suffering of environmental diseases to have a better life.*

**Keywords:** *Cognitive rehabilitation, Environmental diseases, Multiple chemical sensitivity, Fibromyalgia, Chronic fatigue syndrome, Myalgic encephalomyelitis, Electromagnetic hypersensitivity, Idiopathic environmental intolerance*

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## INTRODUCTION

In 1952 Randolph defined the set of disorders complained after exposure to various chemicals as environmental disease. Since then, many similar reports began to be registered: literature contains more than 1500 works and over the years different definitions of this disease have been developed. In 1987 Cullen defined it as: “an acquired disorder characterized by recurrent symptoms, affecting multiple organs and systems, arising in response to demonstrable exposure to chemicals, even at concentrations much lower than those that are capable of causing disorders in the general population”.

Today, multiple chemical sensitivity syndrome (MCS), fibromyalgia, chronic fatigue syndrome (CFS), and electrosensitivity are recognized as environmental diseases (Hvidberg, Schouborg Brinth & Olesen, 2015; Rubin, das Munshi & Wessely, 2006). These serious organic diseases, defined and included in the ICD-10 classification code of the World Health Organization, would be caused by environmental changes and variations in the lifestyles of developed societies (Bartha et al., 1999). In particular, pollution is the cause of syndromes and diseases that keep having an increasing impact, often found in the list of rare diseases (Bartha et al., 1999).

In 1996, the International Programme of Chemical Safety (IPCS) defined MCS as an “acquired disorder with multiple recurrent symptoms, associated with a variety of environmental factors, tolerated by most of the population, and unexplained by currently available internist and psychiatric knowledge”. MCS is a complex pathology characterized by hypersensitivity to chemicals with the onset of a series of generic symptoms affecting various systems and of varying severity (e.g. nausea, headache, malaise, sense of fatigue, anxiety, musculoskeletal pain, sense of suffocation, panic attacks). These consequences tend to occur after an exposure to chemicals - often emanating strong odors - completely harmless for most of the population. The cause of this syndrome is still a matter of debate in the international scientific community. Among the causes hypothesized to date there is an impaired ability to metabolize certain xenobiotic substances due to a genetic deficiency or an alteration of the enzymatic mechanisms responsible for their metabolization (Pall, 2009). Another possible origin could be purely psychosomatic due to the absence of known pathogenic bases, the impossibility of independent testing, the frequent coexistence of psychopathologies and the

positive results of inverted tests (absence of seizures upon unconscious exposure to the incriminated substances and onset of seizures upon exposure to inert substances presented as the incriminated substance). In some cases, the subjective perception of the exposure seems to be more important than the exposure itself.

MCS patients are present all over the country, but an important role is played by the type of work performed, as one of the risk factors would be contact with agents that could trigger the mechanism of sensitization and therefore cause the onset of the disease in subjects.

Cullen (1987) underlined the causal importance of exposure not only to chemical substances (such as toner, bleach, personal hygiene products, detergents, deodorants, petroleum-derived products, micro-dusts, chemicals, paints, glues, polishes) but also to physical risk factors (e.g. electromagnetic fields).

Epidemiological projections, which started in the 1990s (Binkley et al., 2001; Meggs, 1991) to 2009 (Pall, 2009), estimated the incidence of environmental diseases to range from 3 to 10% of the US and European populations (i.e., approximately 9 to 29 million individuals). At the end of a 2016 study regarding a sample of 1137 US adults, Steinemann (2018) states that the incidence of cases diagnosed as MCS has increased by 300% and self-reported hypersensitivity to chemical agents has increased by 200% over the past 10 years.

Useful indications are contained in the “Regional guidelines for the diagnosis and treatment of fibromyalgia” (Azzoni et al., 2018) both from the application point of view and to recognize the characteristics of the disease, still poorly known in the Italian medical field, despite the Consiglio Superiore di Sanità (Health Council) has estimated that about 900,000 people are affected by fibromyalgia (2015). In Italy, the latest estimates assume a 2-5% of the population susceptible to sensitization by chemical compounds, with a clear prevalence in the female sex such as to indicate a gender ratio of about 3:1 (Branco et al., 2010; Salaffi et al., 2005). Branco et al. (2010) estimate, by combining the London Fibromyalgia Epidemiology Study Screening Questionnaire (White, Harth, Speechley & Ostbye, 1999) and the American College of Rheumatology criteria (ACR; Wolfe, 2010), that 3.7% of the Italian population aged 15 years and older would be affected by environmental diseases. According to Salaffi et al. (2005), who instead identified cases through the ACR criteria, it is estimated that 2.2% of the Italian adult population would be affected.

## Research purpose

A constant symptom frame of environmental diseases concerns deficits in memory, attention, and concentration, more generically defined within a set of neurocognitive disorders (Azzoni et al., 2018).

Subjects suffer a relevant worsening of working memory and simultaneous difficulties in attention and in the amount of information they can process. In the most severe situations, damage in executive functions is also present (Orriols et al., 2009). There are no medical or pharmacological therapies to date for this type of damage.

For environmental diseases there are no biomarkers and the etiopathogenesis of the syndromes is still uncertain. It should also be noted that multiple chemical sensitivity allows the assumption of a very small number of drugs, because these are made up of chemicals that could potentially harm the patient. The therapy of choice is the removal of the subject from the agents that are deleterious to him (Youdim, Rea & Liang, 1991).

Fibromyalgia is handled with drugs that can induce a myorelaxant effect, anxiolytics and antidepressants. Oxygen therapy is indicated, as well as the intake of therapeutic cannabis (Azzoni et al., 2018). But the results are not as appreciable as one would wish. The same conclusions are reached for electrosensitivity and chronic fatigue syndrome.

This work is the first to aim at verifying and measuring possible clinical improvements and in daily life of patients with environmental diseases, after a rehabilitation of memory function. To date, in fact, we are not aware of other studies aimed at demonstrating the effectiveness of cognitive training for these diseases.

## METHOD

The rehabilitation therapy of neuropsychological functions used and described here has been implemented for some time, especially in Anglo-Saxon countries, which we know are very sensitive to such practices, but there are no traces in the literature of its use in subjects affected by environmental diseases.

## Participants

The sample consists of an experimental group and a control group. The first group includes 25 subjects suffering from environmental diseases, diagnosed simultaneously by the National Health Service and private specialists. The experimental sample includes 25 patients (21 women, 4 men) from Northern Italy (15), Central Italy (5) and Southern Italy (5), with a mean age of 47.88 years ( $SD = 7.73$ ), with various occupations (company manager, metalworker, socio-sanitary operator, technical operator with secretarial duties, employee in public institution); affected by fibromyalgia (12), MCS (3), fibromyalgia and MCS (3), fibromyalgia, MCS and electrosensitivity (2), fibromyalgia, MCS, CFS and electrosensitivity (5).

The control group consisted of 12 subjects (6 women, 6 men) similar in age and gender composition to the experimental group, with an average age of 50.58 years ( $SD = 8.55$ ) without any environmental symptoms (2 Prato; 2 Florence; 4 Turin; 2 Bologna; 1 Caserta; 1 Arezzo). All subjects were volunteers informed about the aims of this research.

## Materials

The rehabilitation tools used consist of programs on compact disc to be administered during the training phases. This has allowed the subjects, who often have great difficulty in moving, to be able to perform the entire rehabilitation phase at home with their PC, with the same benefits. The tools used for memory training are contained in the program developed by Trevor Powell and Kit Malia: "Training di Riabilitazione Cognitiva [Cognitive Rehabilitation Training]" (2009).

## Administration methodology

Subjects were evaluated with an initial administration of exercises that allow the acquisition of the beginning level of their memory abilities, since the training programs express the percentage of success achieved after each exercise. Approximately two days after the end of treatment, the administration was repeated in order to estimate any changes. The rehabilitation consists of a series of tasks, which activate or reactivate the neural areas involved,

administered individually, each time highlighting the areas of greatest impairment and therefore customizing the mode of training.

Each subject underwent memory function training for 3 to 4 sessions of approximately 1 hour each, over the course of a week, between March 2019 and April 2021. All subjects were trained by the same operator (GC).

## Memory rehabilitation

There were 17 planned memory exercises, subdivided also into multiple exercises of the same type, for a total of 34 exercises, many of them timed. These tasks are listed below in order of presentation.

1. *Ricorda le informazioni [Remember the information]* (3 exercises). The subject is asked to answer a series of questions that they must then rewrite exactly the same.
2. *Ricorda le sequenze [Remember the sequences]* (3 exercises). The subject is placed in front of a sequence of cards that light up containing a word, a musical note, and a sentence fragment and they will have to reconstruct the exact sequence in which these are presented.
3. *Ricorda un disegno [Remember a drawing]* (2 exercises). The subject must observe a drawing for a short period of time and then they must select from a list of words that correspond to the elements in the drawing.
4. *Ricorda i nomi delle persone [Remember people's names]* (3 exercises). The subject is shown the faces and names of 6-8 people and then asked to match them up again.
5. *Il gioco di Kim [Kim's game]* (2 exercises). The subject is shown 12 pictures for a short time, then asked to categorize them.
6. *L'elenco di parole [The word list]*. The subject is asked to remember and divide 15 words into three categories.
7. *Le notizie del giornale [Newspaper news]* (2 exercises). The subject is presented with two articles separately and will have to fill in a diagram by answering some questions.
8. *Chi partecipa al corso? [Who's attending class?]*. The subject is asked to remember a list of names associated with their respective jobs.
9. *Immagini appiglio in rima [Rhyming cue pictures]*. After observing 8 drawings, the subject is asked to write the words corresponding to the drawings without the visual aid, but with the handhold of rhyming words.
10. *La stanza [The room]*. After observing a picture of a

kitchen with various elements, the subject is asked to relocate the missing objects.

11. *La piramide [The pyramid]*. The subject is shown a pyramid with objects from related categories, which he or she will be asked to relocate.

12. *Ricorda il tracciato [Remember the path]* (3 exercises). The subject is asked to reproduce traces of increasing difficulty consisting of dots.

13. *Osserva una persona [Observe a person]* (2 exercises). The subject is presented with pictures of two people which the subject will be asked to remember and describe.

14. *Memoria di immagini [Picture memory]*. The subject is shown 9 pictures that will have to be placed back in their original order.

15. *Il menù cinese [The Chinese menu]*. The subject is asked to select dishes from a Chinese menu, after which he or she will be asked to remember them and choose exactly the same dishes.

16. *Inventare una storia [Inventing a story]* (3 exercises). Three times the subject is presented with key words for a few seconds that he or she will have to include in a story he or she has developed.

17. *Ricorda i numeri [Remember the numbers]* (4 exercises). In this exercise the subject has to memorize and then reproduce three sets of number sequences.

## Statistical analysis

Because of the non-normality of the data, verified graphically and with the Shapiro-Wilk test, we used nonparametric tests for analysis. We applied the Mann-Whitney *U* test to the total score and to individual trials of the memory training program in order to assess differences in initial performance between the two groups. We also tested for differences in subjects' performance using the nonparametric Wilcoxon signed-rank test. The choice of this test over the sign test is motivated by its greater statistical power, as it considers information derived from both the sign of the difference and the magnitude of differences of pairs of scores. Given the non-normality of the data, it was also chosen to summarize them in terms of medians, namely estimators that are unaffected by deviations from normality, as opposed to averages. The significance level of the test was set equal to  $\alpha = .05$ . Data analysis was conducted using the SPSS software (IBM SPSS Statistics v. 25).



## RESULTS

The frequencies of exercises' success regarding the memory training are shown in Table 1 in the form of medians and averages before (pre-test) and after training (post-test) for the two groups, experimental and control. Figure 1, on the other hand, shows the improvement in the total performance of the two groups following the treatment.

The preliminary analysis, aimed at investigating the performance differences between the experimental group and the control group at the pre-test, showed overall differences between the two groups, with the subjects affected by environmental diseases showing significant lower performance than the control group (Total:  $U = 66$ ,  $p = .01$ ); these significant differences are also confirmed for *Le notizie del giornale* [Newspaper news] ( $U = 66$ ,  $p = .01$ ), *Osserva una persona* [Observe a person] ( $U = 73.5$ ,  $p = .03$ ), and *Ricorda i numeri* [Remember the numbers] ( $U = 73$ ,  $p = .03$ ) tests.

Several improvements emerged from the Wilcoxon test that were statistically significant between pre-test and post-test detections in both the experimental and control groups, with the sum of positive ranks being significantly greater than the sum of negative ranks (see Table 2). Specifically, all significant trials in the control group are also significant in the experimental group, but not the other way around. This effect could be due to the lower numerosity of the control group, which resulted in lower power of the statistical test, but also better baseline performance levels in the control group than in the experimental group. The tests in which a significant improvement in the experimental group was observed were *Ricorda le informazioni* [Remember the information], *Ricorda un disegno* [Remember a drawing], *Ricorda i nomi delle persone* [Remember people's names], *L'elenco di parole* [The word list], *Le notizie del giornale* [Newspaper news], *Chi partecipa al corso?* [Who's attending class?], *Immagini appiglio in rima* [Rhyming cue pictures], *La stanza* [The room], *Osserva una persona* [Observe a person], *Memoria di immagini* [Picture memory], and *Inventare una storia* [Inventing a story].

The pyramid exercise turned out too easy for the subjects of both groups, in fact a ceiling effect is observed both at pre and post test.

In the remaining tests *Ricorda le sequenze* [Remember the sequences], *Il gioco di Kim* [Kim's game], *The pyramid* [La piramide], *Ricorda il tracciato* [Remember the path], *Il menù*

*cinese* [The Chinese menu] and *Ricorda i numeri* [Remember the numbers] there is no significant improvement in either the experimental or the control group.

Overall, there is a significant improvement in performance in subjects in the control group and the experimental group, with a 10 percentage point improvement in performance in the latter (see Table 1 and Figure 1).

The increase in the success rate in the “*Chi partecipa al corso* [Who's attending class?]" exercise, considering its difficulty of execution, represents a highly positive sign of the progress of the subjects in both groups. In fact, from the median value of 57, it goes to a median value of 93 for the control group and 86 for the experimental group, which signals a significant improvement in that specific stimulated memory ability. Furthermore, we found overall that the rehabilitation training succeeded in producing progress that was then confirmed by the participants as improvements in their daily lives.

Similar results occurred in the control group. Here, the starting level of the abilities under examination was higher; therefore, the improvements obtained were of less conspicuous intensity than those achieved by the subjects affected by the syndromes, but they proceeded in the same direction.

## CONCLUSION

Environmental diseases are pathologies still a little unknown, although they are constantly increasing. Among these, multiple chemical intolerance, fibromyalgia, chronic fatigue syndrome and electrosensitivity are known. These diseases share the causes which are linked to environmental changes and share the symptoms that fall under the umbrella of neurocognitive deficits.

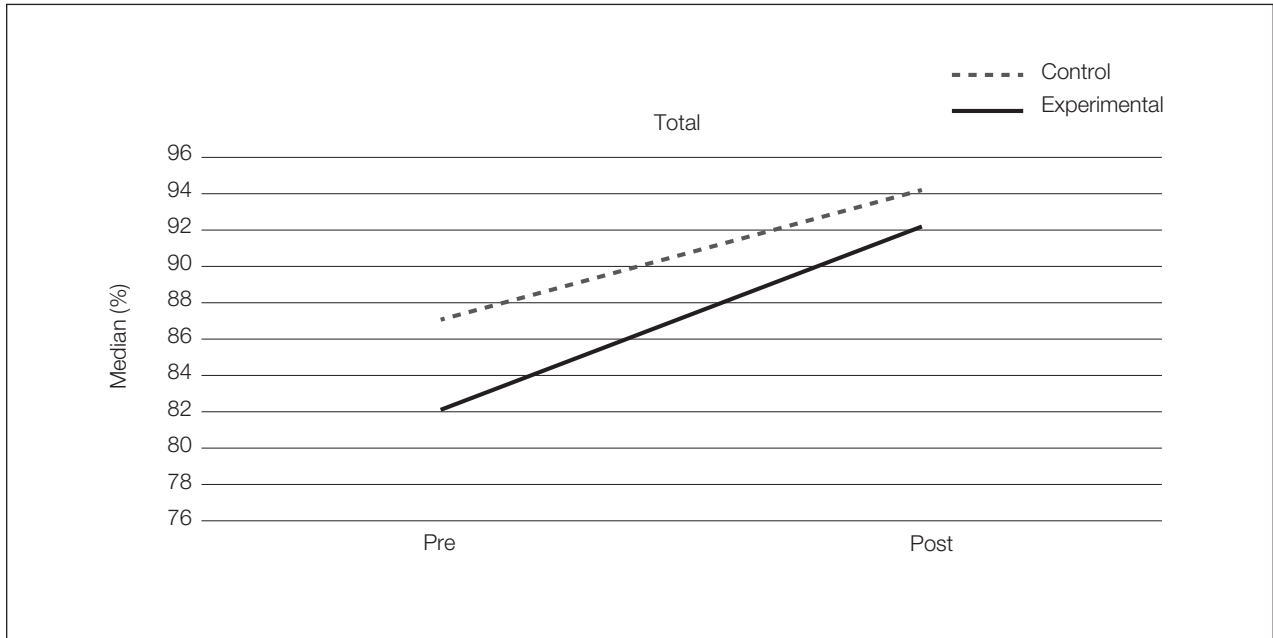
The purpose of this work was to test a possible mnemonic improvement in patients suffering from these diseases following training of specific and standardized exercises, administered about two/three days apart.

Following such training, an overall improvement in memory abilities was observed, which occurred in 11 of the 17 trials (65 %) in the experimental group.

The follow-up of the patients in the months following the end of the training showed that in some there were partial relapses of the improvements acquired, probably due to the interruption of cognitive training. This has led

**Table 1** – Descriptive statistics of pre- and post- treatment success rates in the two groups

	Group							
	Control				Experimental			
	Media		Median		Media		Median	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Ricorda le informazioni [Remember the information]	94	98	94	98	91	94	92	96
Ricorda le sequenze [Remember the sequences]	94	91	94	99	85	89	94	97
Ricorda un disegno [Remember a drawing]	87	90	86	91	87	90	86	91
Ricorda i nomi delle persone [Remember people's names]	89	97	91	100	86	93	91	100
Il gioco di Kim [Kim's game]	96	95	100	100	96	95	100	100
L'elenco di parole [The word list]	56	68	60	67	49	68	47	67
Le notizie del giornale [Newspaper news]	83	99	80	100	68	95	70	100
Chi partecipa al corso? [Who's attending class?]	53	86	57	93	47	77	57	86
Immagini appiglio in rima [Rhyming cue pictures]	93	100	100	100	87	95	88	100
La stanza [The room]	84	100	71	100	84	98	100	100
La piramide [The pyramid]	100	100	100	100	100	97	100	100
Ricorda il tracciato [Remember the path]	97	97	100	100	92	94	92	96
Osserva una persona [Observe a person]	80	94	80	100	71	92	70	95
Memoria di immagini [Picture memory]	94	100	100	100	85	96	100	100
Il menù cinese [The Chinese menu]	99	99	100	100	98	99	100	100
Inventare una storia [Inventing a story]	93	91	91	89	85	93	89	100
Ricorda i numeri [Remember the numbers]	84	94	100	100	65	74	75	75
<b>Total</b>	87	94	87	94	81	91	82	92

**Figure 1** – Pre- and post- treatment success rates in the two groups

to the development of three maintenance programs already clinically tested with success, with a smaller structure compared to the training programs administered previously. These programs have the same efficacy as the full training programs in stimulating the neural areas, so that in the near future people affected by these diseases can at least recover, if not completely, a significant part of the decayed functions regressed over time.

The limitations of this research are mainly due to the difficulty of organizing a randomized controlled trial, since this is a group of rare diseases. In Italy, in particular, there seems to be a lack of contributions not only on these diseases, but publications specifically on neuropsychological damage are also lacking in the broad sense, that is, concerning diseases with larger sample sizes and a greater spread within the general population.

**Table 2** – Results of the nonparametric Wilcoxon signed-rank test

	Group							
	Control				Experimental			
	Negative ranks	Positive ranks	Z	p	Negative ranks	Positive ranks	Z	p
Ricorda le informazioni [Remember the information]	2	43	2.442	<b>.015</b>	49	182	2.325 <sup>b</sup>	.020
Ricorda le sequenze [Remember the sequences]	26	10	1.123	.261	77.5	112.5	.707 <sup>b</sup>	.480
Ricorda un disegno [Remember a drawing]	6	39	1.992	<b>.046</b>	12	124	2.929 <sup>b</sup>	.003
Ricorda i nomi delle persone [Remember people's names]	5.5	30.5	1.757	.079	20	116	2.486 <sup>b</sup>	.013
Il gioco di Kim [Kim's game]	12	9	.333	.739	46	45	.038 <sup>c</sup>	.969
L'elenco di parole [The word list]	5	23	1.527	.127	29.5	246.5	3.307 <sup>b</sup>	<b>.001</b>
Le notizie del giornale [Newspaper news]	0	36	2.536	<b>.011</b>	0	325	4.405 <sup>b</sup>	<b>&lt;.001</b>
Chi partecipa al corso? [Who's attending class?]	0	55	2.816	<b>.005</b>	0	231	4.023 <sup>b</sup>	<b>&lt;.001</b>
Immagini appiglio in rima [Rhyming cue pictures]	0	15	2.121	<b>.034</b>	10	81	2.513 <sup>b</sup>	<b>.012</b>
La stanza [The room]	0	21	2.449	<b>.014</b>	10	81	2.581 <sup>b</sup>	<b>.010</b>
La piramide [The pyramid]	0	0	0	1.000	3	0	1.414 <sup>c</sup>	.157
Ricorda il tracciato [Remember the path]	7	8	.138	.890	75	135	1.132 <sup>b</sup>	.258
Osserva una persona [Observe a person]	0	36	2.585	<b>.010</b>	0	276	4.214 <sup>b</sup>	<b>&lt;.001</b>
Memoria di immagini [Picture memory]	0	6	1.732	.083	4	62	2.607 <sup>b</sup>	<b>.009</b>
Il menù cinese [The Chinese menu]	1.5	1.5	0	1.000	2.5	7.5	1.000 <sup>b</sup>	.317
Inventare una storia [Inventing a story]	16.5	4.5	1.294	.196	39.5	131.5	2.013 <sup>b</sup>	<b>.044</b>
Ricorda i numeri [Remember the numbers]	5	16	1.190	.234	40	113	1.882 <sup>b</sup>	.060
<b>Total</b>	0	66	2.936	<b>.003</b>	0	325	4.373 <sup>b</sup>	<b>&lt;.001</b>

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