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Psychosocial and behavioral correlates of self-efficacy in treatment adherence in older patients with comorbid hypertension and type 2 diabetes

BACKGROUND
Adhering to clinical prescriptions is known to protect against the effects of uncontrolled hypertension and of acute and chronic cardiovascular diseases, including diabetes. Contextually, positive associations between self-care behaviors and psychological constructs, such as self-efficacy, are widely acknowledged in the literature. However, still little is known about the psychological factors underlying the patient's self-efficacy. This study aimed to investigate the psychosocial and behavioral correlates of self-efficacy related to treatment adherence in older patients with comorbid hypertension and type 2 diabetes mellitus.

PARTICIPANTS AND PROCEDURE
Italian and Polish patients (≥ 65 years; $N = 180$) consecutively responded to self-report questionnaires measuring psychosocial (i.e., beliefs about medicines, perceived physician's communication effectiveness, medication-specific social support, self-efficacy) and behavioral factors (i.e., pharmacological adherence, medications refill adherence, intentional non-adherence) related to treatment adherence. Between-group comparisons and regression analyses were performed.

RESULTS
Fisher's least significant difference (LSD) test showed significant differences between the Italian and Polish groups in all questionnaires ($p < .01$) with the Italian patients reporting more satisfactory scores. Younger age ($\beta = .08$, $p = .045$), female gender ($\beta = 1.03$, $p = .042$), higher medication refills adherence ($\beta = -.07$, $p = .024$), lower intentional non-adherence ($\beta = -.03$, $p = .009$), positive beliefs about medications ($\beta = .13$, $p < .001$), better quality of communication with the physician ($\beta = .09$, $p < .001$), and stronger perceived medication-specific social support ($\beta = .06$, $p = .001$) were significantly associated with self-efficacy related to treatment adherence.

CONCLUSIONS
Future research and interventions should leverage psychosocial and behavioral factors to address self-efficacy contributing to enhancing adherence to clinical prescriptions.

KEY WORDS
adherence; self-efficacy; type 2 diabetes mellitus; hypertension; chronicity

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BACKGROUND

Hypertension and type 2 diabetes mellitus are among the most common diseases and cardiovascular risk factors all over the world, and their occurrence rises with increasing age (Ferrannini & Cushman, 2012; Sinclair et al., 2020). In 2015, a global incidence of 1.13 billion was estimated for hypertension (NCD Risk Factor Collaboration, 2017), with a prevalence of over 150 million in central and Eastern Europe. According to the European Cardiology Society/European Society of Hypertension (ESC/ESH) guidelines (Williams et al., 2018) the overall prevalence is around 30-45% among adults. Specifically, hypertension becomes progressively more common with advancing age, with a prevalence of more than 60% in people over 60 years (Williams et al., 2018). As people age, adopt sedentary lifestyles, and increase their body weight, the prevalence of hypertension worldwide will continue to rise. It is estimated that the number of people with hypertension will increase by 15-20% by 2025, reaching almost 1.5 billion (Maffoni et al., 2020). As to diabetes, in 2019, it was estimated that 19.3% of people all over the world aged 65 years and over (135.6 million, 95% CI: 107.6-170.6 million) live with diabetes (Sinclair et al., 2020). Moreover, elevated blood pressure values are a common finding in patients with type 2 diabetes mellitus (Ferrannini & Cushman, 2012) and, additionally, problems related to carbohydrate metabolism are more common in hypertensive individuals, indicating that the etiologic relationship between diabetes and hypertension may be bidirectional (Tsimihodimos et al., 2018).

Old age is often associated with multimorbidity, cognitive decline, and frailty. The presence of comorbid hypertension and diabetes adds complexity to the patients' daily self-management of therapeutic prescriptions (Jankowska-Polańska et al., 2021; Maffoni et al., 2020). Such complexity could entail incorrect following of therapeutic prescriptions, namely therapeutic non-adherence, that could, in turn, lead to critical consequences for patients' health, including increased risk of mortality, disability, and more frequent hospital admissions (Shin et al., 2014). The World Health Organization (WHO) defines adherence as: "the extent to which a person's behavior – taking medication, following a diet, and/or executing style changes – corresponds with the agreed recommendations from a provider" (WHO, 2003). Accordingly, it is assumed that adherence is a process in which many factors play a central role in reaching the therapeutic goals, such as patients' motivation, health literacy, beliefs and concerns about medicines, self-efficacy, social support, and the relation with the healthcare provider (Magrin et al., 2015; Náfrádi et al., 2016; Shiyanbola et al., 2018).

Non-adherence can be classified as intentional or unintentional, according to the patient's perspective (Weinman et al., 2018). Intentional non-adherence refers to deliberate non-adherence that is mainly associated with patient motivation, while unintentional non-adherence is mainly driven by a lack of capacity or resources to follow therapeutic prescriptions. Specifically, for the latter, prior studies on cardiovascular populations indicated, for instance, significant associations with psychosocial factors such as beliefs about illness and medications, self-efficacy and emotional status (Horne et al., 2013; Vrijens et al., 2012). A lack of cooperation between the patient and the healthcare provider was also evidenced as one of the most predisposing determinants of non-adherent behaviors resulting in therapy unsuccessfulness (Vahdat et al., 2014). Similarly, social support was found to play a role in treatment adherence and, notably, to be strongly associated with one's ability to follow medical prescriptions (Turan et al., 2019). Furthermore, a recent systematic review evidenced that self-efficacy was significantly associated with at least one self-management behavior, that is exercise, healthy diet, adherence to medication, blood glucose testing, and foot care (Qin et al., 2020).

As yet, the literature on self-efficacy has acknowledged this construct as one of the key factors impacting treatment adherence among chronic patients (Shahin et al., 2019). Self-efficacy is a psychological construct that refers to an individual's belief in his/her capacity to execute behaviors necessary to produce specific performance attainments. It reflects confidence in the ability to exert control over one's own motivation, behavior, and social environment (Bandura, 1998). Besides being considered a key factor contributing to achieving therapeutic goals, self-efficacy has been recognized as an outcome in turn affected by psychosocial and behavioral factors, too. However, limited studies have focused on older patients with coexisting hypertension and diabetes and even fewer studies have specifically explored their self-efficacy in dealing with such diseases and treatment adherence. Accordingly, in a previous study specifically on patients suffering from hypertension and comorbid multiple chronic diseases, it was found that higher perceived self-efficacy in relation to pharmacological and non-pharmacological adherence was associated with higher adherence to refill medications, higher levels of perceived physician's communication effectiveness, positive beliefs about medications, and higher perceived medication-specific social support (Zanatta et al., 2020).

Based on these findings, we expected to replicate the results, finding consistent observations on a sample of older patients specifically suffering from comorbid hypertension and type 2 diabetes mellitus. For this purpose, the present study explored the inter-relationships among specific psychosocial (i.e., beliefs and concerns about medicines, communication with the healthcare provider, and perceived

medication-specific social support) and behavioral (self-reported pharmacological adherence, adherence to medication refills, intentional non-adherence) factors and their associations with self-efficacy related to treatment adherence.

PARTICIPANTS AND PROCEDURE

PARTICIPANTS

The current observational, cross-sectional, and multicenter study involved two institutions: Istituti Clinici Scientifici (ICS) Maugeri of Montescano (Italy) and the Department of Clinical Nursing of Medical University of Wroclaw (Poland). Between March and July 2019, Italian inpatients undergoing rehabilitation, Polish inpatients, and Polish outpatients were recruited consecutively.

A non-probability purposive sampling method was adopted. Inclusion criteria were as follows: age above 65 years, diagnosis of hypertension according to the ESH guidelines (Williams et al., 2018) under regular treatment with at least 1 antihypertensive drug for a minimum of 6 months, and diagnosis of type 2 diabetes mellitus under regular medication regimen. Patients affected by further concomitant chronic diseases (e.g., chronic obstructive pulmonary disease, Parkinson's disease, chronic heart failure, osteoporosis) were evaluated with the Cumulative Illness Rating Scale (CIRS) and were considered eligible. Exclusion criteria comprised: severe clinical conditions (i.e., chronic heart failure NYHA-IV, coronary heart disease CCS-IV, neoplastic disease, acute respiratory disease), severe visuo-perceptive and language deficits, severe psychiatric disorders, refusal to undergo the research evaluation, and severe cognitive impairment evaluated with the Mini-Mental State Examination (MMSE; score ≤ 18.3).

The preliminary patient selection was conducted by a panel consisting of an internal medicine physician and a nurse specialist who performed a comprehensive physical examination and a double blood pressure check. Then, a researcher conducted cognitive screening with the identified patients to confirm their eligibility. All enrolled patients provided socio-demographic (i.e., age, gender, educational level, marital status) data and then underwent self-report assessment. Patients were asked to respond by referring to the last 4 weeks (for the inpatients, the last 4 weeks before the hospitalization). Questionnaire completion was conducted independently in a dedicated room of the institution and assisted by a researcher in case of the need for clarification or help throughout the testing session (45 minutes). Before the end of the session, a researcher checked for completeness to avoid any missing data. Overall, the healthcare personnel of both institutions was informed of the purpose and the protocol of the study to ensure consistency in procedures and the data collection process.

ETHICAL CONSIDERATIONS

Participation in the study was on a voluntary basis and no form of reimbursement was provided. Patients signed informed consent for data collection and treatment. The research was approved by the Institutional Review Board and Central Ethics Committee of the ICS Maugeri (approval number: CEC N. 2304/2019) and Polish consent of the bioethics commission (approval number: KB 265/2019). The study was conducted according to the Helsinki Declaration and the principles of good clinical practice, with respect for participants' rights and dignity.

MEASURES

The assessment consisted of self-report questionnaires investigating the psychosocial and behavioral factors related to treatment adherence (Table 1). Permission to use the questionnaire was requested and obtained by the original authors.

Psychosocial factors

The psychosocial evaluation comprised the following measures:

The 10-item Beliefs about Medicines Questionnaire (BMQ-10), which identifies general attitudes and beliefs towards medicines, the necessity of, and the degree of concern about the medications the patient currently takes. It comprises 10 items evaluated on a 5-point Likert scale. Higher scores reflect higher necessity and lower concerns, and, thus, positive beliefs about medicines. Both Italian and Polish versions of the BMQ-10 were validated among cardiovascular patients and provided satisfactory reliability scores (Argentero et al., 2010; Karbownik et al., 2020). The Italian version showed good reliability coefficients for Necessity (α = .78) and Concerns (α = .72) subscales. Similarly, the Polish validation reported good internal consistency scores (Cronbach's α ranging from .64 to .82).

The Communication Assessment Tool (CAT), which measures the patient's perception of and satisfaction with physician's communication abilities. The CAT has 15 items scored on a 5-point scale. Higher scores correspond to a higher quality of physician-patient communication. Its validation showed high overall reliability coefficients (α = .96) (Makoul et al., 2007).

The Multidimensional Scale of Perceived Social Support (MSPSS), which explores the patient's perception of medication-specific social support pro-

Table 1

Summary of measures and scores interpretation

Measures	Construct	Scores interpretation (↑ high, ↓ low)	
		Scores	Construct
MGLS	Medication adherence	↑	↑
ARMS	Medication refill adherence	↑	↓
INAS	Intentional non-adherence	↑	↑
ASonA	Cognitive, behavioral, and emotional factors related to treatment adherence	↑	↑
ASonA-SE	Self-efficacy related to treatment adherence	↑	↑
BMQ-10	Beliefs about medications	↑	↑
CAT	Perception of and satisfaction with physician's communication abilities	↑	↑
MSPSS	Perception of medication-specific social support	↑	↑

*Note.*MGLS – Morisky Green Levine Scale; ARMS – Adherence to Refills and Medication Scale; INAS – Intentional Non-Adherence Scale; ASonA – Antecedents and Self-efficacy on Adherence Schedule; ASonA-SE – Antecedents and Self-efficacy on Adherence Schedule (Self-efficacy subscale); BMQ-10 – Beliefs about Medicines Questionnaire; CAT – Communication Assessment Tool; MSPSS – Multidimensional Scale of Perceived Social Support.

vided by family, friends, and significant others. It is composed of 12 items scored on a 7-point Likert scale. Higher scores refer to stronger perceived support. The Italian validation (Di Fabio & Palazzeschi, 2015) showed satisfactory overall internal consistency (α = .91), as well as for the three subscales: Family (α = .92), Friends (α = .90), and Significant Others (α = .93). Similarly, the Polish version (Adamczyk, 2013) provided high reliability coefficients for the total scale (α = .89) and the three subscales: Family (α = .89), Friends (α = .94), and Significant Others (α = .90).

The Antecedents and Self-efficacy on Adherence Schedule (ASonA) to evaluate the cognitive, behavioral, and emotional factors related to treatment adherence. It is a 23-item schedule consisting of three subscales: Antecedents (ASonA-A), which explores perceived health condition and health-related limitations acceptance, social support, and knowledge about health condition; Self-efficacy (ASonA-SE), which measures the patient's self-care strategies and ability to adhere to a medical regimen and non-pharmacological recommendations (i.e., physical activity, diet, alcohol consumption, and smoking avoidance); Affectivity (ASonA-Aff), which evaluates the patient's emotional state in relation to the perceived health condition. For each subscale, higher scores refer to a better perception of the evaluated factor. The administration of this schedule in the present study sample provided satisfactory reliability scores for each subscale (ASonA-A, α = .78; ASonA-SE, α = .74; ASonA-Aff, α = .68). The ASonA has already shown significant evidence in patients affected by chronic multimorbidity and hypertension (Zanatta et al., 2020), and it belongs to a wider group of similar schedules used in prior works with patients affected by chronic obstructive pulmonary disease (COPD; Pierobon et al., 2017), coronary heart disease (Pierobon et al., 2016), and chronic heart failure (Granata et al., 2022). The Italian and Polish versions were administered and can be requested from the authors (for more information, see the English version provided as supplementary material).

Behavioral factors

The following questionnaires were used:

The 4-item MGL Adherence Scale for pharmacological adherence (MGLS) to evaluate medication adherence behaviors and barriers, i.e. forgetfulness, carelessness, adverse effects, and perceived efficacy. Lower scores reflect pharmacological non-adherence. The MGLS provided relatively high concurrent and predictive validity (α = .61) in the high blood pressure population (Morisky et al., 1986).

The Adherence to Refills and Medication Scale (ARMS) to measure medication refill adherence behavior. It is a 12-item instrument evaluated on a 4-point Likert scale in which higher scores correspond to lower adherence. The original version of the ARMS showed high internal consistency (α = .81) and a strong negative correlation with the 4-item MGLS (rho = −.65) among patients with chronic conditions (Kripalani et al., 2009). A Polish validation in adult

patients with hypertension was also conducted and reported high internal consistency scores (α = .95) (Lomper et al., 2018).

The Intentional Non-Adherence Scale (INAS) to assess intentional non-adherence. It is composed of 22 items, scored on a 5-point Likert scale and, specifically, it explores the reluctance to take medicines as they remind one of one's illness (Resisting Illness Subscale, RI) and the desire to omit or reduce treatment (Testing Treatment Subscale, TT). Higher total scores refer to stronger intentional non-adherence behaviors. The INAS validation provided satisfactory reliability scores for both subscales (RI, α = .95; TT, α = .97) in different clinical conditions, including hypertension (Weinman et al., 2018).

STATISTICAL ANALYSES

Descriptive statistics on socio-demographic and clinical characteristics of the sample and on the self-reported measures were calculated. Means and standard deviations (*SD*) for continuous variables and percentages for categorical variables were reported distinguishing three subgroups, namely Italian inpatients undergoing rehabilitation, Polish inpatients, and Polish outpatients. Normal distribution of data was tested by calculating skewness and kurtosis indices, and respective recommended ranges ±2 and ±7 were considered for normality (Hair et al., 2010). Between-group comparisons of the above-mentioned variables were conducted with one-way ANOVA and the chi-squared test. Fisher's least significant difference (LSD) test was chosen as a post-hoc procedure. A correlation analysis (Pearson's *r* coefficient) was performed to identify the associations among adherence behaviors and related psychosocial factors. Cut-off values of ≤ .39, .40-.69, ≥ .70 were considered for weak, moderate, and strong correlation, respectively (Schober et al., 2018). Furthermore, a multivariate analysis of the simultaneous impact of demographic, psychosocial factors, and adherence behaviors, as the independent variables (i.e., age, gender, BMQ-10, CAT, MSPSS, ARMS, INAS), on patient's self-efficacy related to treatment adherence (ASonA-SE), as the dependent variable, was made by means of multiple linear regression. Adjusted R^2 and *F* test coefficients of the model were reported for the explained variance and model fit, respectively. Sample size adequacy was established by carrying out power analysis (Cohen, 1988), using G*Power software version 3.1.9.7 (Faul et al., 2007). The sample size required to perform multiple linear regression was calculated with the following parameters: effect size $f^2 = 0.15$, α = .05, and power (1-β) = 0.90. The sample size calculated was 130 individuals. Based on these considerations, the sample size of the study was sufficient to detect medium size effects. The level of significance was fixed at .05. Data analysis was performed with the support of R software (3.6.1 version).

RESULTS

SAMPLE CHARACTERISTICS

A total of 180 patients met all inclusion criteria and responded to self-report questionnaires. Specifically, 24 were Italian inpatients under rehabilitation, 61 were Polish inpatients, and 95 were Polish outpatients. The mean age of the total sample was 72.10 ± 6.30. No significant differences emerged for all socio-demographic data except for the marital status ($p = .028$). As for the clinical characteristics, the mean values of systolic and diastolic blood pressure (mmHG) were 138.70 ± 15.70 and 82.90 ± 10.60, respectively. The mean BMI score was 30.60 ± 5.20 and the number of hypertension medicines used was on average 2.10 ± 1.10. All sample characteristics divided for the three subgroups are presented in Table 2. Comparative analysis showed significant between-group differences for the systolic blood pressure ($p < .001$) and the number of chronic comorbidities ($p = .004$). Fisher's LSD post-hoc test showed that systolic blood pressure was significantly higher in Polish inpatients and outpatients than Italian inpatients, and that Polish inpatients presented a significantly higher number of chronic comorbidities than the other two subgroups. No significant between-group differences emerged for marital status.

PSYCHOSOCIAL AND BEHAVIORAL FACTORS RELATED TO TREATMENT ADHERENCE

Mean and standard deviation scores of the total sample and the three subgroups, including their comparisons, are presented in Table 3. The one-way ANOVA test showed significant between-group differences in all measures ($p < .01$). Fisher's LSD post-hoc test indicated that the Italian inpatient subgroup obtained statistically significantly more satisfactory mean scores in all measures than the other two subgroups. No significant post-hoc differences emerged between Polish inpatients and outpatients regarding the psychosocial factors investigated.

RELATIONSHIPS WITH SELF-EFFICACY IN TREATMENT ADHERENCE

Pearson's *r* coefficient values for all psychosocial and behavioral factors related to adherence are reported in Table 4. Specifically, self-efficacy scores (ASonA-SE) showed a moderate negative correlation with medication refill non-adherence behaviors (ARMS, $r = -.42$,

Table 2

Socio-demographic and clinical characteristics of the study sample (N = 180)

	Italian inpatients (A) *n* = 24	Polish inpatients (B) *n* = 61	Polish outpatients (C) *n* = 95	*p**	Posthoc°	Total *N* = 180
Age (years), *M* (*SD*)	74.10 (7.00)	71.70 (5.80)	71.90 (6.30)	.241		72.10 (6.30)
Gender, *n* (%)				.094		
Male	14 (58.3)	20 (32.8)	40 (42.1)			74 (41.1)
Female	10 (41.7)	41 (67.2)	55 (57.9)			106 (58.9)
Marital status, *n* (%)				.028		
Married/Living with a partner	17 (70.8)	24 (39.3)	42 (44.2)			83 (46.1)
Single/Widowed/ Divorced	7 (29.2)	37 (60.7)	53 (55.8)			97 (53.9)
Education, *n* (%)				.121		
Primary school or less	24 (39.3)	17 (70.8)	42 (44.2)			83 (46.1)
Secondary school	29 (47.5)	5 (20.8)	42 (44.2)			76 (42.2)
University	8 (13.1)	2 (8.3)	11 (11.6)			21 (11.7)
BMI (kg/m²), *M* (*SD*)	28.40 (5.40)	30.80 (4.20)	31.00 (5.60)	.079		30.60 (5.20)
SBP (mmHg), *M* (*SD*)	123.80 (12.90)	141.20 (12.90)	139.90 (16.30)	< .001	B,C > A	138.70 (15.70)
DBP (mmHg), *M* (*SD*)	80.60 (24.00)	83.40 (6.30)	83.10 (8.70)	.602		82.90 (10.60)
Number of chronic comorbidities, *M* (*SD*)	1.60 (0.70)	2.30 (1.10)	1.80 (0.80)	.004	B > C,A	1.90 (0.90)
Number of hypertension, drugs used, *M* (*SD*)	1.80 (1.00)	2.20 (1.30)	2.10 (1.00)	.333		2.10 (1.10)

Note. (A) – Italian inpatients under rehabilitation; (B) – Polish inpatients; (C) – Polish outpatients. *p-value, ANOVA for continuous variable and χ^2 test for categorical variables. °Fisher's LSD test was used as a post-hoc procedure. Only significant pairwise comparisons are reported. BMI – body mass index; SBP – systolic blood pressure; DBP – diastolic blood pressure.

p < .001) and intentional non-adherence (INAS, r = −.41, p < .001), and a moderate positive correlation with beliefs about medicines (BMQ-10, r = .50, p < .001), physician-patient communication quality (CAT, r = .49, p < .001), and medication-specific social support (MSPSS, r = .47, p < .001). No significant correlations with medication adherence behaviors (MGLS) were found.

In the multiple linear regression (Table 5), younger age (β = −.08, p = .045), female gender (β = 1.03, p = .042), higher medication refill adherence (ARMS, β = −.07, p = .024), lower intentional non-adherence (INAS, β = −.03, p = .009), positive beliefs about medications (BMQ-10, β = .13, p < .001), better quality of communication with the physician (CAT, β = .09, p < .001), and stronger perceived medication-specific social support (MSPSS, β = .06, p = .001) were significantly associated with higher levels of self-efficacy in relation to treatment adherence. The model explained 47.1% of the variance and a large effect size was estimated (f^2 = 0.89). A significant regression equation was found [F(7, 171) = 23.63, p < .001].

DISCUSSION

To date, research and clinical practice on adherence have principally focused on medication adherence-related behaviors (Granata et al., 2020; Shiyanbola et al., 2018), more than behavioral, cognitive, social, and emotional antecedents related to treatment adherence (Pierobon et al., 2016, 2017; Xie et al., 2020; Zanatta et al., 2020). For this reason, the present research aimed to explore the interrelationship among specific psychosocial and behavioral factors and their simultaneous impact on self-efficacy associated with treatment adherence, in older patients suffering from comorbid hypertension and type 2 diabetes melli-

Table 3

Mean scores of the study sample and between-group comparisons

Measure (range)	Italian inpatients under rehab (A)	Polish inpatients (B)	Polish outpatients (C)	p^*	Posthoc°	Total
	M (*SD*)					*M* (*SD*)
MGLS (0-4)	3.60 (0.60)	1.8 (1.20)	2.30 (1.30)	< .001	A > C > B	2.30 (1.30)
ARMS (14-56)	18.80 (1.90)	27.10 (7.00)	31.20 (9.90)	< .001	C > B > A	28.20 (9.30)
INAS (22-110)	24.40 (4.90)	42.90 (20.70)	50.80 (20.50)	< .001	C > B > A	44.60 (21.10)
AsonA (0-80)	61.70 (8.40)	44.30 (10.60)	45.40 (9.00)	< .001	A > C,B	47.20 (11.10)
AsonA-SE (0-24)	20.80 (2.30)	15.80 (4.50)	15.60 (4.30)	< .001	A > B,C	16.40 (4.50)
BMQ-10 (10-50)	42.80 (6.10)	25.10 (4.70)	25.80 (5.30)	< .001	A > C,B	27.80 (7.90)
CAT (15-75)	63.70 (7.60)	48.80 (14.20)	51.30 (11.80)	< .001	A > C,B	52.10 (13.00)
MSPSS (12-84)	71.20 (11.30)	59.80 (16.40)	60.50 (14.40)	.004	A > C,B	61.70 (15.20)

Note. $^*p$-value, one-way ANOVA test. °Fisher's LSD test was used as post-hoc procedure. MGLS – Morisky Green Levine Scale; ARMS – Adherence to Refills and Medication Scale; INAS – Intentional Non-Adherence Scale; ASonA – Antecedents and Self-efficacy on Adherence Schedule; ASonA-SE – Antecedents and Self-efficacy on Adherence Schedule (Self-efficacy subscale); BMQ-10 – Beliefs about Medicines Questionnaire; CAT – Communication Assessment Tool; MSPSS – Multidimensional Scale of Perceived Social Support.

Table 4

Pearson's r correlation coefficient values of self-reported measures

	1	2	3	4	5	6	7	8
1. MGLS	–							
2. ARMS	.47***	–						
3. INAS	−.02	−.31***	–					
4. ASonA	.03	−.37***	−.35***	–				
5. ASonA-SE	−.10	−.42***	−.41***	.85***	–			
6. BMQ-10	.23**	−.40***	−.38***	.54***	.50***	–		
7. CAT	−.04	−.25***	−.18*	.61***	.49***	.38***	–	
8. MSPSS	−.17*	−.33***	−.33***	.50***	.47***	.28***	.37***	–

Note. $^*p < .05$, $^{**}p < .01$, $^{***}p < .001$. MGLS – Morisky Green Levine Scale; ARMS – Adherence to Refills and Medication Scale; INAS – Intentional Non-Adherence Scale; ASonA – Antecedents and Self-efficacy on Adherence Schedule; ASonA-SE – Antecedents and Self-efficacy on Adherence Schedule (Self-efficacy subscale); BMQ-10 – Beliefs about Medicines Questionnaire; CAT – Communication Assessment Tool; MSPSS – Multidimensional Scale of Perceived Social Support.

tus. For the present study, treatment adherence was examined by taking into consideration the patient's perspective rather than specific direct measurements. The evaluation of the psychosocial factors consisted of an examination of the beliefs about medications, the patient's perception and satisfaction with the physician's communication abilities, the perceived medication-specific social support, the adherence antecedents (i.e., knowledge about and perceived health condition, health-related limitations acceptance, and emotional state), and the self-efficacy associated with therapeutic prescriptions. As for the behavioral factors, the focus was on the attitude toward pharmacological treatment, adherence to refill medications, and intentional non-adherence. To the best of our knowledge, the current research is the first to investigate and compare self-reported adherence and the aforementioned psychosocial and behavioral factors among older Italian and Polish patients suffering from comorbid hypertension and type 2 diabetes mellitus.

Table 5

Results from the multiple linear regression analysis with self-efficacy (AsonA-SE) as dependent variable

	β	*SE*	*t*	95% CI		*p*
Age	−.08	.04	−2.02	−.157	−.002	.045
Gender	1.03	.50	2.05	.038	2.02	.042
ARMS	−.07	.03	−2.28	−.127	−.009	.024
INAS	−.03	.01	−2.64	−.060	−.009	.009
BMQ-10	.13	.04	3.61	.061	.208	< .001
CAT	.09	.02	4.28	.049	.132	< .001
MSPSS	.06	.02	3.28	.024	.096	.001

Note. β – unstandardized regression coefficient; ARMS – Adherence to Refills and Medication Scale; INAS – Intentional Non-Adherence Scale; ASonA-SE – Antecedents and Self-efficacy on Adherence Schedule (Self-efficacy subscale); BMQ-10 – Beliefs about Medicines Questionnaire; CAT – Communication Assessment Tool; MSPSS – Multidimensional Scale of Perceived Social Support.

The findings show that patients' clinical characteristics were heterogeneous. A significant difference emerged for systolic blood pressure (SBP), being higher in Polish patients, who also presented more chronic comorbidities. The results for blood pressure are not surprising if we consider the difference among the samples in terms of hospitalization. Indeed, unlike the Polish patients, the Italian group was attending an inpatient multidisciplinary rehabilitation, and thus their clinical parameters were constantly monitored and a specific treatment was provided if necessary. Moreover, as already suggested in prior works, cardiac rehabilitation was shown to appreciably contribute to promoting adherence to therapeutic prescriptions (Karmali et al., 2014), particularly among older patients (O'Neill & Forman, 2019), representing therefore a protective factor predisposing to better clinical outcomes.

As to the investigated psychosocial and behavioral factors, the results show that the Italian patients obtained significantly more satisfactory scores than the two Polish subgroups. As to the psychosocial factors, the observed disparities may lie in the cultural, contextual, and healthcare differences within the sample (McQuaid & Landier, 2018). For the behavioral ones, the differences could be explained by the fact that the Polish patients presented a worse clinical condition, displaying therefore more difficulties in managing therapeutic prescriptions.

Significant associations from the multiple linear regression analysis were found. The findings showed that age was negatively associated with self-efficacy, meaning that being older is related to a lower perception of one's ability to follow treatment prescriptions. As yet, the literature has shown contradictory results on the relationship between age and adherence. Some studies on patients with hypertension and diabetes suggested that older age correlates with poorer adherence (Jankowska-Polańska et al., 2018; Karakurt & Kaşikçi, 2012), while some others indicated that better adherence is more frequent among the elderly (Kang et al., 2017; Xie et al., 2020). Our results should be explained taking into account the chronic multimorbidity of the sample, supporting prior evidence that acknowledges that the co-occurrence of different clinical conditions could affect one's ability to follow therapeutic prescriptions (Wong et al., 2014). A significant association was also found with gender. Similarly to age, the correlation between adherence and gender has been deeply discussed in the literature and the results are often inconsistent (Xie et al., 2020). Despite this, our results are in line with a recent study on comorbid hypertensive and diabetic patients, which found that female gender was associated with higher levels of adherence (Jankowska-Polańska et al., 2020). Furthermore, significant associations were observed between self-efficacy and all the investigated psychosocial factors. More positive beliefs about medications, higher quality of communication with the physician, and stronger perceived medication-specific social support were significantly related to higher levels of self-efficacy in relation to treatment adherence. These findings are in line with prior works on patients with hypertension and multimorbidity, which indicated that positive beliefs towards medicines, as well as higher levels of perceived need for medications and related lower levels of concern, reflect a better attitude towards treatment adherence (Náfrádi et al., 2016; Rajpura & Nayak, 2014). These results also support the relevance of psychosocial aspects and positive psychological attributes in therapeutic adherence (DuBois et al., 2015). Accordingly, a recent systematic review underscored the importance of considering individual beliefs, especially perceived barriers and self-efficacy, when aiming at increasing patient treatment adherence (Al-Noumani et al., 2019). Our results also corroborate what emerged in prior research on patients with diabetes concerning the positive rela-

tionship between adherence to treatments for chronic diseases and the physician's communication style, the degree of collaboration, the patient's involvement in discussing the treatment goals and plans, and the possibility to express thoughts and feelings (Martin & DiMatteo, 2013; Ratanawongsa et al., 2013). Consistent results were also obtained in a more recent study on patients with hypertension, revealing that satisfaction with physician-patient communication has a significant positive impact on self-care and pharmaceutical adherence, meaning that the more satisfied the patients are with communication, the better is their adherence to medical recommendations (Świątoniowska-Lonc et al., 2020). Similar patterns were also identified for the impact of social support. Nevertheless, although prior studies on patients suffering from hypertension and diabetes highlighted the positive influence of social support on adherence (Jankowska-Polańska et al., 2018; Scheurer et al., 2012), some others also stressed the importance of its perception and quality (Magrin et al., 2015). Following this line, our results support this idea, underscoring that a more positive perception of medication-specific social support contributes not only to better treatment adherence but also to higher levels of self-efficacy. Accordingly, the association between social support and self-efficacy was already explored in a prior work, which also outlined their positive impact on the adherence to self-care behaviors in a sample of patients with diabetes (Karimy et al., 2018).

As concerns the associations with the behavioral factors, adherence to medication refills and intentional non-adherence were found to be significantly related to self-efficacy, indicating that being more adherent to medication refills and being less intentionally non-adherent contribute to higher levels of self-efficacy. These associations suggest that better health-related behaviors may have a positive effect on the perception of one's ability to follow clinical recommendations, supporting the idea that a positive behavior may play itself a role of reinforcement for the person's motivation and strategic skills, resulting in the empowerment of the patient, who increases his/her self-efficacy. Accordingly, the Three-Factor Model has already underlined the importance of behavioral factors, such as the level of engagement and the implementation of oriented strategies, in order to maintain long-lasting adherence (Martin & DiMatteo, 2013).

Overall, our results add evidence to existing literature on the role of self-efficacy in treatment adherence among chronic patients. Notably, the present work attempted to explore adherence considering the patient's perspective and, above all, considering self-efficacy, not strictly as a predictor, but as an outcome variable. Evaluating self-efficacy in relation to treatment adherence from this point of view made it possible to explore its psychosocial and behavioral determinants. As a result, the associations found provided an informative insight into the antecedents of treatment adherence in psychosocial and behavioral terms and, consequently, they may represent a precious contribution to helping to enrich the already existing interventions for older patients suffering from comorbid chronic diseases such as hypertension and type 2 diabetes mellitus.

LIMITATIONS AND STRENGTHS

For the present study, we acknowledge some limitations. Firstly, adopting a cross-sectional study design made it impossible to observe the associations over time, limiting the potential longitudinal influence of the evaluated factors. Moreover, treatment adherence was evaluated based on self-report measures. Concerning this point, a prior study (Giardini et al., 2016) indicated that self-report methods to assess adherence are partially limited due to different reasons (e.g., risk of false positives and lack of sensitivity to change, psychometric adequacy of the assessment instrument, social desirability bias, patient's cognitive status). Nevertheless, some advantages such as high practicality of use, clinical and research applicability, and cost-effectiveness were presented, too.

In contrast, the strengths of this study are represented by the multicenter research design, which allowed us to enroll patients from two different nations with different cultural backgrounds, and in three different clinical settings (hospital inpatients, hospital inpatients attending cardiac rehabilitation, and hospital outpatients). Although this heterogeneity could potentially represent a limit to the internal validity of our findings, satisfactory effect sizes were observed along with adequate regression model fit scores. This allowed us to draw more generalizable conclusions from robust results. Further similar studies are needed to confirm their replicability. In conclusion, the present study is the first to explore, in older Italian and Polish patients with comorbid hypertension and type 2 diabetes mellitus, the simultaneous impact of specific psychosocial and behavioral factors on self-efficacy related to treatment adherence. This focus offered the advantage of making the study results unique among publications on this topic in this segment of the population, and made it possible to understand which psychosocial and behavioral factors to consider when aiming at improving the patient's daily self-management of therapeutic prescriptions.

CONCLUSIONS

The current research represented a first attempt to explore among older Italian and Polish chronic patients with comorbid hypertension and type 2 diabetes mellitus the psychosocial and behavioral determinants of

self-efficacy related to treatment adherence. The findings showed that more positive beliefs about medications, higher satisfaction with physician-patient communication, stronger perceived medication-related social support, lower intentional non-adherence, and better adherence to refill medications were significantly associated with patient's self-efficacy related to treatment adherence. Adopting a patient-reported adherence approach, future clinical research and practice may take into account these associations in order to develop further empirical assessments and psychosocial and behavioral interventions with the purpose of fostering adherence to clinical prescriptions, and consequently, increasing health-related quality of life of this chronic population.

Supplementary material is available on journal's website.

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