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ORIGINAL ARTICLE

Influence of the mode of administration on the results of medication adherence questionnaires

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Abstract

Introduction and objectives: Adherence to medication regimen is commonly assessed through questionnaires, some of which are validated via self-administration. The inadequate health literacy of elderly people pushes researchers to the use of interviews as a method of administration. The aims of this study were to compare the results obtained with an interviewer-administered and a self-administered medication adherence questionnaire and to evaluate the consequences of the adherence status classification of individuals.

Methods: A cross-sectional study was performed in which the Medida de Adesão aos Tratamentos adherence questionnaire was administered to adult patients who were taking at least 1 antihypertensive drug. The data were collected in 7 community pharmacies in central Portugal between March 2014 and September 2015 in 2 different phases: in the first phase, the questionnaire was applied during a healthcare professional interview, and the second phase involved a self-report administration. A confirmatory factor analysis was conducted, and the measurement and structural invariances across the application methods were examined.

Results: A sample of 425 patients with a mean age of 68.21 ± 10.56 years participated in the study. The confirmatory factor analysis revealed that both the interview and self-report had a good fit with the original model, although the self-report results exhibited a better fit. In the interview administration, we obtained lower values for skewness and higher levels of kurtosis. The patients subjected to the interview administration presented with a 9.7% higher tendency to answer "never" when compared with the self-administered application, which overestimated adherence.

Conclusions: The interview administration method induced bias that led to a higher percentage of "never" answers and a subsequent overestimation of adherence levels. Self-report administration should be preferred in the application of medication adherence questionnaires.

KEYWORDS

bias (epidemiology), medication adherence, patient outcome assessment, patient preference, reproducibility of results, surveys and questionnaires

1 | INTRODUCTION

In clinical practice, a patient's adherence to medication is commonly assessed with questionnaires. The method used for collecting patient-reported data, especially the mode of administration (MOA), is receiving increasing attention because of its consequences on the accuracy, reliability, and quality of the obtained data.[1-6]

When designing a questionnaire, researchers should decide which MOA is more effective to optimize the results based on the characteristics of the target population.[7] The 2 methods that are most commonly

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used are interviewer administration and self-administration. The interviewer-administered method, in which the interviewer reads questions to the patient and records the responses, ensures that the questionnaire is fully completed but adds costs to the administration of the survey, and the interviewer may unintentionally influence the answers. The self-administered method, in which the questions are answered personally by the patient in written form, is less likely to be affected by phenomena such as social desirability or response acquiescence and is easier and cheaper to apply, but it may result in a larger number of item non-responses and is strongly dependent on the patients' functional literacy level.[7-9]

Apparently, the self-report method seems to be the most appropriate and attractive method for applying questionnaires. However, the level of the health literacy of the population must be accounted for. Health literacy is defined as an individual's capacity to access, understand, and use basic health information and services to make appropriate health decisions.[10] Health literacy includes 2 components: oral literacy and print literacy. The first is based on listening and speaking skills, while the latter is based on writing, reading, and numeracy skills.[10] These different skills do not necessarily run in parallel in each individual.

Health literacy rapidly declines after the age of 55 years, and adults over the age of 65 years have the lowest health literacy levels when compared with younger age groups.[11-13] In most cases, medication adherence questionnaires evaluate patients who take drugs chronically, and these patients typically compose an older population that is known to have a lower level of health literacy.[12,13] This fact means that older people may have more difficulties understanding and completing the questionnaires. Thus, the self-report method may not be the best solution for the population that is frequently studied with adherence questionnaires, and the interviewer-administered method is the most commonly used alternative.

Our aim was to assess the effects of the MOA on a medication adherence questionnaire by examining the differences between self-report administration and interviewer administration.

2 | METHODS

This was a cross-sectional study that was approved by the Ethics committee of the Faculty of Medicine of the University of Coimbra (registration number CE_105.2013). The study aims and procedures were explained to all the eligible patients, and inclusion was validated after acquiring written informed consent from the patients.

The data were collected in 7 community pharmacies in the central region of Portugal (urban and rural) between March 2014 and September 2015. All patients over 18 years of age who were taking at least 1 antihypertensive drug and visiting the pharmacies that participated in the study were invited to join. In the first phase of data collection, the questionnaire was applied in the form of an interview to a sample of 299 patients. The interview was performed by a trained pharmacist in a private office in which data regarding personal and family history were also collected. In the second phase of data collection, because of the requirement of the MOA, the ability to read was added as an inclusion criterion. The questionnaire was applied in a

self-report manner to a sample of 126 patients. The completion of the questionnaire was performed in a private office in which data regarding personal and family history were also collected. In all received questionnaires, pharmacist assessed the completeness. If items were missing, the patient was encouraged to fill them up.

After requesting the permission of the authors, we used the Medida de Adesão aos Tratamentos (Measure Treatment Adherence) (MAT) to evaluate the differences between the interview and self-report applications. The MAT,[14] which was created in 2001, is a Portuguese medication adherence questionnaire that assesses the antihypertensive therapy adherence of hypertensive patients. This instrument consists of 7 items that are scored according to a 6-point Likert scale that ranges from *always* to *never*. The level of adherence is obtained by adding the values of each item and then dividing by the total number of items. Higher scores indicate greater levels of adherence. The classification of patients as adherent or nonadherent is made according to the distribution of the scores around the median. The instrument has a good internal consistency, with a Cronbach alpha of 0.74, and exhibits good concurrent validity when compared to pill counting,[14] with a correlation coefficient of 0.48.

To evaluate the differences in item endorsement between the MOA samples, we evaluated the items' distribution shapes (kurtosis) and asymmetries (skewness). We also analysed the frequencies of extreme answers.

To compare the results of the self-report and the interview versions of the MAT, we tested the fit of the original model to the data using confirmatory factor analysis in MPLUS.[15] We estimated the models using the variance-adjusted weighted least squares estimation method, a robust estimator recommended when data are ordered. The chi-square statistic is reported. However, because this statistic is sensible to sample size, other fit indices will be used to ascertained model fit, namely, the comparative fit index (CFI), the root mean square error of approximation (RMSEA) and the weighted root mean square residual (WRMR). Comparative fit index values above 0.95 suggest good fit; RMSEA below 0.06 indicates very good fit and below 0.10 indicates reasonable error of approximation; WRMR values below 0.9 are suggestive of good fit.

To examine the measurement and structural invariances across the MOAs, we followed the recommendations of Vanderberg and Lance.[16] First, we examined the configural invariance, and in so doing, the same factor structures were tested simultaneously for both groups with no imposed equality constraints on any of the parameters. The fit of this model served as the baseline model to which the other more restrictive models were compared. Second, we examined measurement invariance, namely, metric invariance (assuming equal factor loadings across groups) and scalar invariance (assuming equal item intercepts across groups). Finally, we also inspected and compared both groups of the values for skewness, kurtosis, and extreme values.

A cautionary note should be added in this section. When testing multigroup differences across groups using the variance-adjusted weighted least squares estimator, the software requires that all groups have the same categories endorsed. To accomplish this, we had to aggregate some response categories. Because the interview group has the least categories endorsed, the aggregation was performed in the self-report group, slightly reducing is variability.

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3 | RESULTS

A sample of 425 patients participated in the study, the mean age was 68.21 ± 10.56 years, and 226 (53.2%) were female. The overall adherence level was good with a global mean MAT score of 5.74 ± 0.33. Demographic details of the sample for both MOAs are presented in Table 1.

3.1 | Analysis of item endorsement

Table 2 presents the shape of the distribution of answers according to MOA, including the kurtosis and skewness of the distributions, and Table 3 presents the differences in the item endorsements between the MOA samples. In the interview administration, we obtained lower values of skewness and higher levels of kurtosis, which indicated that the distribution of answers in this MOA tended to be less symmetrical. The numbers of extreme answers differed in the 2 MOAs; a lower percentage of individuals answered "never" in the self-report group than the interviewer-administered group for all items (Figure 1).

3.2 | Confirmatory factor analysis

The tested model exhibited a good fit to the data, with a chi-square value of 67.80 (df = 14) (P < .001), a CFI of 0.95, RMSEA of 0.10, and WRMR of 1.05.

3.3 | Testing the invariances of the MATs across MOAs

The results of the confirmatory factor analyses that were separately performed on each sample are presented in Table 4. Fit indices for the interview group are all below the recommended values; fit indices for the self-report group are all above the recommend value, suggesting a better fit to the model.

Nevertheless, we proceeded with the invariance testing, to test whether both methods are assessing the same construct. The results from the configural model in which equality constraints were included were acceptable (chi-square (48) = 94.3, P < .001; CFI = 0.94; RMSEA = 0.11; WRMR = 1.379), allowing for sequential analysis for examining invariance. As can be seen in Table 4, the factor structure is invariant at the metric and scalar level. These results confirm that the construct being measured is the same across MOA's, although it

was also evident that the data fitted the model better when the questionnaire was filled by the participants using a self-report approach.

4 | DISCUSSION

We explored the influence of MOAs on the results from a self-reported medication adherence questionnaire. The MAT, an original Portuguese-created instrument, was selected to avoid biases produced in cross-cultural validation processes. In this study, the MAT was confirmed to be a good instrument for assessing hypertensive patients' adherence to antihypertensive medication regimens. Our confirmatory factor analysis demonstrated a very good fit to the data not only in the global model but also in both application methods. This finding indicates that in both MOAs, the MAT scores correctly represent adherence to antihypertensive medication regimens. Nonetheless, the adherence levels as assessed with the 2 MOAs were different. In the interview-administered method, we obtained lower values of skewness and higher levels of kurtosis, which indicates that the distributions of answers that were provided to an interviewer tended to be less symmetrical, which makes it difficult to differentiate nonadherent patients. These data confirm those obtained in the frequency analysis of the answer distributions, which revealed a 9.7% increase in the likelihood of answering "never" in the interview-administration method. If we consider the scoring system of the MAT in the interview method, there was a tendency to overestimate adherence. This bias could have been motivated by the interview methodology being more influenced than the self-report method due to phenomena such as social desirability and response acquiescence.[2,7,17] This finding was defended by Bowling et al[9] in their narrative review on the effects of the mode of the administration of questionnaires on data quality. Because interviews involve social interaction with another person, this MOA can lead respondents to take social norms into account when answering, which results in a social desirability bias and leads to an over-reporting of desirable behaviours, such as adherence to medication. Additionally, when all of the questions evaluating the same issue are negative statements, patients tend to answer "no" to all of the questions regardless of the content, and this phenomenon is known as "no-saying."[18,19] This phenomenon potentially led to a greater number of answers of "never" in the interview method, which would have contributed to the overestimation of adherence levels in this MOA. These results are also

TABLE 1 Demographic characteristics or participants

	Interviewer Administered MOA (n = 299)	Self-report MOA (n = 126)	t/χ²	P	Cohen d/ Cramer V
Mean age	68.32 ± 10.75	67.94 ± 10.16	0.35	.730	0.04
Sex (% female)	53,5	52,4	0.05	.832	0.10
Average time since hypertension diagnose(years)	10.63 ± 8.48	11.00 ± 8.47	−0.41	.679	0.04
Diabetes (% yes)	27.8	23.8	0.71	.471	0.04
Dyslipidemia (% yes)	53.2	52.4	0.02	.915	0.01
Stroke(% yes)	8.7	5.6	1.22	.325	0.05
Heart disease (% yes)	25.8	27.8	0.19	.718	0.02
Family history of hypertension (% yes)	39.8	45.2	1.08	.332	0.05
MAT mean score	5.78 ± 0.28	5.65 ± 0.42	3.26	.001	0.36

Abbreviations: MAT, measure treatment adherence; MOA, mode of administration.

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TABLE 2 Shape of the distribution of answers according to MOA

	Kurtosis		Skewness	
Items	Interview	Self-report	Interview	Self-report
1) Alguma vez se esqueceu de tomar os medicamentos para a sua doença? Do you sometimes forget to take the medication for your illness?	0.08	3.89	−1.01	−1.33
2) Alguma vez foi descuidado com as horas da toma dos medicamentos para a sua doença? Have you ever been careless about the time to take the medication for your illness?	1.61	6.92	−1.62	−1.96
3) Alguma vez deixou de tomar os medicamentos para a sua doença por se ter sentido melhor? Have you ever stopped taking your medication because you felt better?	21.39	6.28	−4.56	−2.53
4) Alguma vez deixou de tomar os medicamentos para a sua doença, por sua iniciativa, após se ter sentido pior? Have you ever stopped taking your medication without telling your doctor because you felt worse when you took it?	17.85	7.32	−4.11	−2.79
5) Alguma vez tomou mais um ou vários comprimidos para a sua doença, por sua iniciativa, após se ter sentido pior? Have you ever taken more medication for your disease without telling your doctor because you felt worse?	96.30	13.89	−9.88	−3.67
6) Alguma vez interrompeu a terapêutica para a sua doença por ter deixado acabar os medicamentos? Have you ever stopped taking your medication because you run out of pills?	3.07	0.80	−1.81	−1.34
7) Alguma vez deixou de tomar os medicamentos para a sua doença por alguma outra razão que não seja a indicação do médico? Have you ever stopped taking your medication for some other reason than doctor's orders?	72.61	20.93	−8.45	−4.45

TABLE 3 Item endorsements between the MOA samples

Item		Always	Almost always	Frequently	Sometimes	Rarely	Never	χ^2	df	p
1) Alguma vez se esqueceu de tomar os medicamentos para a sua doença?	I	_	_	2.3%	14.0%	29.1%	54.5%	20	5	0,001
	SF	0.8%	0.8%	_	18.3%	43.7%	36.5%			
2) Alguma vez foi descuidado com as horas da toma dos medicamentos para a sua doença?	I	_	_	0.7%	9.4%	18.1%	71.9%	14	4	0,008
	SF	0.8%	_	_	10.3%	31.7%	57.1%			
3) Alguma vez deixou de tomar os medicamentos para a sua doença por se ter sentido melhor?	I	_	_	0.7%	2.7%	3.0%	93.6%	15	4	0,005
	SF	_	0.8%	0.8%	9.5%	6.3%	82.5%			
4) Alguma vez deixou de tomar os medicamentos para a sua doença, por sua iniciativa, após se ter sentido pior?	I	_	_	_	0.7%	6.0%	93.3%	6.6	2	0,036
	SF	_	_	_	3.2%	10.3%	86.5%			
5) Alguma vez tomou mais um ou vários comprimidos para a sua doença, por sua iniciativa, após se ter sentido pior?	I	_	_	_	_	1%	99%	17	2	0
	SF	_	_	_	1.6%	7.1%	91.3%			
6) Alguma vez interrompeu a terapêutica para a sua doença por ter deixado acabar os medicamentos?	I	_	_	1.0%	5.0%	22.4%	71.6%	1.9	3	0,574
	SF	_	_	_	5.6%	26.2%	68.3%			
7) Alguma vez deixou de tomar os medicamentos para a sua doença por alguma outra razão que não seja a indicação do médico?	I	_	_	_	1.0%	0.7%	98.3%	13	3	0,004
	SF	_	_	1.6%	1.6%	4.8%	92.1%			

Abbreviations: I, interview; MOA, mode of administration; SF, self-report.
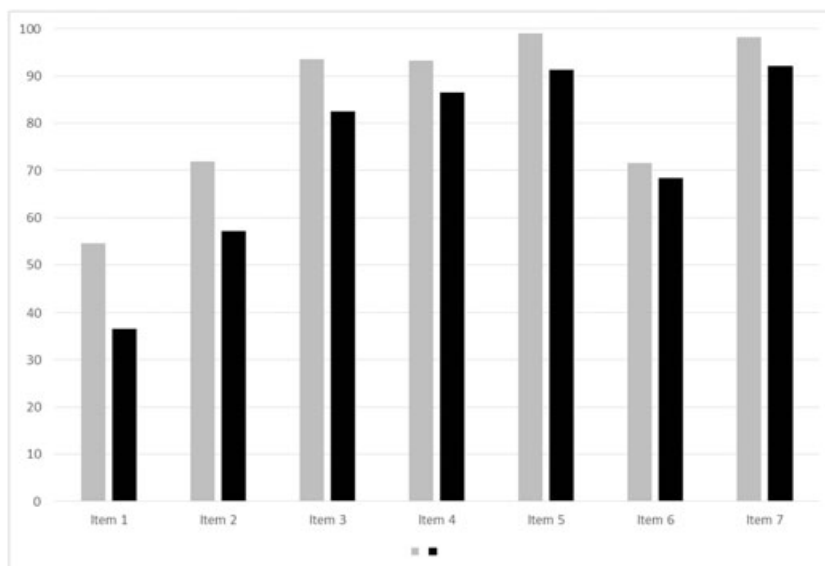

FIGURE 1 Proportion of patients answering "never" in self-report and in interview methodologies

TABLE 4 Fit indices for confirmatory factor analysis between the samples, separately and invariance model testing

	Model	χ^2	df	P	$\Delta\chi^2$	Δdf	Δp	CFI	RMSEA	WRMR
	Interview	68.22	14	<.001				0.91	0.11	1.159
	Self report	30.63	14	.006				0.97	0.10	0.747
	Invariance testing									
1	Configural invariance	94.73	28					0.94	0.08	1.379
2	Metric invariance	90.17	34		7.85	6	0.249	0.95	0.07	1.471
3	Scalar invariance	98.95	43		7.50	9	0.585	0.95	0.06	1.505

Abbreviations: CFI, comparative fit index; df, degrees of freedom; RMSEA = root mean square error of approximation (RMSEA); WRMR = weighted root mean square residual.

consistent with those of Leggett et al,[20] who reported a tendency to overestimate adherence in questionnaire evaluations of adherence.

These differences are also a potential bias that must be accounted for when meta-analysing adherence data. High heterogeneity has been presented as a weakness in professional healthcare interventions,[21] specifically those that aim to reduce nonadherence.[22] It is known that the use of different methods to assess adherence increases heterogeneity in meta-analyses,[23] but the information regarding the heterogeneity induced by the use of different application methods is not yet conclusive.

Therefore, despite the finding that interview-administered questionnaires seem to be more attractive for use in elderly populations, the self-report administration method is more highly recommended. In patients with low levels of health literacy, who can compromise the results of self-reports, the use of a multimethod approach that combines feasible self-reporting and reasonable objective measures, as recommended the by World Health Organization,[24] seems to be more accurate.

4.1 | Limitations of the study

Because our sample was quite old, the generalizability of our results may not be guaranteed; however, instruments that assess medication adherence in hypertensive patients are mainly used in this age group. Our conclusions are based only on 1 instrument, but there is no reason to assume that the results would be different for other instruments.

5 | CONCLUSIONS

Although the interview administration of medication adherence questionnaires is the most attractive method for elderly and low-literacy patients, caution is needed in the interpretation of the results. Compared to self-report administration, interviewer administration is affected by social desirability and response acquiescence resulting in significantly higher mean scores, which may influence when classifying the patient as adherent or not.

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