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## Research Article

# Sociodemographic, Clinical, and Psychological Barriers to Medication Compliance: The Case of Patients with Musculoskeletal Disorders in Greece

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**Background:** Several studies indicate that a large percentage of patients do not show compliance with medication.

**Aim:** To investigate, in the context of a cross-sectional design, the sociodemographic (gender, education, marital status, having an unpaid/paid assistant, financial status, place of residence, insurance, work status, type of work), clinical (state of musculoskeletal disorder, comorbidity), as well as psychological (physical and mental fatigue) barriers to medication compliance among Greek patients with musculoskeletal disorders.

**Method:** In this study, 145 elderly patients (51 males and 94 females) with musculoskeletal disorders participated. The mean age was  $74.8 \pm 9.12$ . Fatigue Assessment Scale (FAS) and Self - Efficacy For Appropriate Medication Use Scale (SEAMS) were used to collect research data.

**Results:** Results demonstrated that there was a statistically significant difference between patients with different educational levels. Specifically, those with after-lyceum education (post-secondary education) presented higher medication compliance compared to those who were gymnasium graduates ( $W=4.060$ ,  $p=0.033 < 0.05$ ). There were statistically significant differences between patients with different levels of severity regarding their musculoskeletal disorder. Specifically, those patients presenting pretty or very serious problems noted lower compliance in comparison to those with a bit serious problem ( $W=-4.47$ ,  $p=0.009 < 0.05$ ,  $W=-5.05$ ,  $p=0.002 < 0.05$ ). Results also indicated that there was a statistically significant effect of physical and mental fatigue on the level of medication compliance. Specifically, the results showed that those patients who were extremely fatigued expressed a lower level of compliance compared to those who were non-fatigued or fatigued.

**Discussion:** Sociodemographic, clinical, and psychological factors seem to play a crucial role in these patients' compliance.

## Introduction

Compliance is the response of patients to the various advice/instructions given by health care providers. As early as the 1970s, the first attempt to describe this term was based on whose compliance is "the degree to which a person's behavior, as involves taking medication, accompanied by diets or lifestyle changes, coincides with medical advice." Based on the science of medicine, the term compliance is called the level with which sufferers adhere to or disregard the suggestions of health scientists<sup>[1]</sup>. In other words, it is "the right drug at the right dose at the right time"<sup>[2]</sup>. In the context of compliance, there are two other conditions which have been used: the concept of adherence and staying (persistence). As for the concept of attachment, it is broad and tends to replace the term "compliance" as it refers to active participation of the individual as well as in chronic diseases<sup>[3]</sup>. The World Health Organization describes compliance "to what extent a person's behavior (in relation to receiving medication, the adoption of dietary habits and lifestyle changes) is consistent with the patient-acceptable instructions given by a healthcare professional". The non-attachment is, for example, the doubling of the dosage and delaying treatment, contrary to the doctor's instructions. We could report patient loyalty of 50% in the case where the doctor's instruction is to take 1 pill a day and the actual intake by the patient is 1 every two days. In addition, with the concept of stay, the temporal duration of initiation to cessation of physician orders is stated<sup>[4]</sup>.

A large percentage of patients do not show compliance with medication<sup>[4]</sup>. By non-adherence, we mean taking prescribed doses in the wrong way and/or time, the change in the frequency of medication, stopping the treatment earlier than the prescribed time interval, or interval shooting with long time gaps, the deliberate neglecting of visits to the therapist, the unconscious as well as the non-conscious obedience and observance of medical advice, and compliance in parts with which the sufferer is compliant depending on the proximity of visits to the doctor, i.e., he increases his compliance with the treatment over time only after seeing the therapist<sup>[1]</sup>. We encounter three types of non-compliance with different characteristics. The first type is the conscious disobedience to the medical instructions and therefore the medication (primary non-adherence), when a problem occurs and there is a lack of

communication or cooperation between doctor and patient, misinterpretations, and no training on the correct intake of the drug. Difficulties in accessing it result in non-compliance, which is related to the second type of compliance, which is rarely a result of the patient's behavior or perception (non-persistence), and the third type of non-compliance is receiving the medicine differently from the medical instructions, at a different time and dose (non-conforming)<sup>[4]</sup>.

The main factors related to medication non-adherence to treatment constitute the non-reminding of their treatment, placement of other priorities during the day, missed doses, absent information about the disease, emotional reasons, difficulty accessing health structures, complex and long-term treatment, fear of possible undesirable actions/side effects, the age of the patient, especially if she is old, social rejection and isolation, standard of living, psychological illnesses, earlier life, the relationship with the treating doctor, and the support from the close environment. There are cases where it depends on the patient being compliant by taking his medication on a daily basis, but on weekends and holidays, he does not receive them, as a result of which the treatment is interrupted.

Based on a review of the current literature regarding patients with chronic diseases in countries of the western world, the compliance of patients is about 50%. Specifically, half of the patients, after personal decision, do not actively participate in their treatment, and the other half consider the process complicated and do not proceed with the right way of treatment implementation<sup>[4]</sup>. In a study by Theofilou and Anyfantopoulou<sup>[5]</sup> regarding the influence of social support and physical as well as mental fatigue on medication adherence in Greek elderly patients suffering from musculoskeletal disorders, the results indicated the statistically significant correlation of physical fatigue to medication adherence ( $p < 0.05$ ). Further, there was a statistically significant and negative association of mental and total fatigue with medication adherence, social support coming from significant others and family, and overall social support ( $p < 0.05$ ). In addition, perceived social support from family was significantly and negatively correlated to medication adherence ( $p < 0.05$ ).

Bibliographic references prove that for short-term treatments, patient compliance reaches 70%-80% for pharmacolepsia and 20%-30% for lifestyle change. 50% of asthma patients do not take their prescribed

asthma medication, and correspondingly, a percentage of 50–70% of hypertensives do not show compliance with the lawsuit. Adherence to treatment for any disease is 70%, 63% when it is preventive treatment, and 50% for long-term treatments, either they are preventive or therapeutic in nature<sup>[6]</sup>. In patients with cancer, the rate of adherence to pharmacolepsies varies depending on the age; adult patients showed 41% compliance, while adolescents up to 53%<sup>[7]</sup>. In addition, diabetic patients comply with 25% to 65% with dietary advice and 20% with insulin<sup>[8]</sup>. Believing non-compliance, taking medicines at the wrong time, etc., missed doses are the usual forms of non-compliance, with the understanding that clinical practice could shape strategic solutions to this problem. Theoretical knowledge is clearly not enough for successful drug treatment; much more, there should be stable and essential communication between the patient and medical staff, with constant visits, acceptance and participation in the treatment by the sufferer, properly executed and in writing prescription, and correct administration of the drug at the correct time and dose.

Non-observance of treatment and medical directions creates numerous problems in clinical practice and leads to negative clinical results/outcomes with increased financial impact. Here, it must be reported that medication adherence is the biggest cause of interest, i.e., the right intake at the right time of the right medicine and at the correct dose. Non-compliance with the recommended medication is due to 23% for residential care and 10% for inpatient care in the United States of America. As a result, non-compliance costs reach hundreds of billions of dollars in the United States as well. In America, this amount is estimated at approximately 13.35 billion dollars each time. Also, with non-compliance, no improvement in the health of the person is observed. Although drugs have evolved to be effective, in cases of non-compliance, recovery ranges at low rates of efficiency, and therefore the expected result is not achieved. Individuals, in addition to the effects on their physical health, face possible influences on their psychological state, and their social and professional relationships are affected. The result of non-compliance does not concern exclusively the sufferer and their social circle but also the general population as mortality increases and morbidity worsens<sup>[9]</sup>.

Lack of motivation, physical constraints, pain self-efficacy, anxiety, depression, poor social support, negative practices of physical activity, and beliefs

about OA also may affect adherence in this group of patients<sup>[10]</sup>. The external factors include the encouragement and professional care of physiotherapists towards patients, while environmental factors include weather and appropriate/adaptable exercise environments<sup>[11]</sup>.

The aim of the present study was to investigate the sociodemographic (gender, education, marital status, having an unpaid/paid assistant, financial status, place of residence, insurance, work status, type of work), clinical (state of musculoskeletal disorder, comorbidity) as well as psychological (physical and mental fatigue) barriers to medication compliance among Greek patients with musculoskeletal disorders.

## Method

The present study is a quantitative cross-sectional study. The variables which were included are medication compliance, sociodemographic variables (gender, education, marital status, having an unpaid/paid assistant, financial status, place of residence, insurance, work status, type of work), clinical variables (state of musculoskeletal disorder, comorbidity) as well as psychological variables (physical and mental fatigue).

In this study, the convenience sample consisted of 145 elderly patients (94 females and 51 males) suffering from musculoskeletal problems who visited open protection center for the elderly of Social Organization of Municipality of Patra. The mean age of this sample was 74.8±9.12. The inclusion criteria were to be diagnosed with a musculoskeletal problem, being >18 years old, and having the ability to communicate in the Greek language. The exclusion criteria were: a) not diagnosed with musculoskeletal disorders, b) below 18 years old, c) not able to communicate in Greek.

Patients completed the scale "The Fatigue Assessment Scale (FAS)" evaluating fatigue as a one-dimensional experience. It includes 10 questions (5 questions for physical and 5 for mental) based on a five-point Likert-type scale (from 1=never to 5=always). The score ranges from 10 to 50. FAS is considered a very reliable measurement tool not only in healthy individuals but also in people dealing with ailments<sup>[9]</sup> <sup>[10]</sup><sup>[11]</sup><sup>[12]</sup>. The cut-off scores are presented below<sup>[12]</sup> <sup>[13]</sup><sup>[14]</sup><sup>[15]</sup>.

- FAS score below 22 means "not fatigued"

- FAS score greater than or equal to 22 means “fatigued”
- FAS score greater than or equal to 35 means “extremely fatigued”

Compliance with the therapeutic treatment was evaluated using the tool "Self-Efficacy for Appropriate Medication Use Scale (SEAMS)". The SEAMS is a validated self-report scale, based on Bandura's social cognitive theory, and it is developed for chronic disease patients. It measures the patient's confidence in his/her ability to take his/her medication every day correctly. The scale shows high internal reliability and strong validity. It includes 16 questions, on a Likert scale (1=not at all sure, 2=somewhat sure, 3=very sure) with a range score between 16 and 48. Higher scores indicate higher self-efficacy in adherence to treatment<sup>[16]</sup>. The SEAMS was translated and validated in Greek by Theofilou<sup>[17][18]</sup>.

Patients were informed about the aim of the present study, the anonymity and confidentiality of the research data, as well as their right to discontinue

their participation at any time during the survey. The study was approved by the open protection center for the elderly of the Social Organization of the Municipality of Patra (number 1887/3-28-2024). All statistical analyses were performed using the Jamovi Statistical Program. The Shapiro-Wilk test showed that the population distribution did not follow a normal distribution ( $p < 0.05$ ). To investigate the effect of the severity of musculoskeletal disorder, the level of fatigue as well as the education level on medication compliance, Kruskal Wallis test was performed. The effect of fatigue level was also investigated using ANOVA (post hoc tests).

## Results

Sociodemographic and clinical characteristics of the sample are presented below (Table 1). Specifically, the mean duration of years since the diagnosis of musculoskeletal problems was  $16.2 \pm 11.9$ , and the duration of treatment was  $13.8 \pm 11.2$ . The mean age of the sample was  $74.8 \pm 9.12$ .

	Age	Children	Family members/roommates	Years since diagnosis of musculoskeletal problems	Duration of treatment
N	145	145	145	145	145
Mean	74.8	2.29	0.862	16.2	13.8
Standard deviation	9.12	1.44	0.955	11.9	11.2
Minimum	11	0	0	1	1
Maximum	91	12	7	50	50

**Table 1.** Sociodemographic and clinical characteristics of the sample.

In Table 2, frequencies of sociodemographic characteristics are presented. Specifically, the majority of the patients were females (64.8), married (53.8), with municipal education (53.8), retired (84.1), with heavy manual work (47.6), with no paid/unpaid assistant (68.3), with moderate financial status (44.8), living in an urban area (67.6%), and having a public insurance (95.2%).

<b>Gender</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
Male	51	35.2	35.2
Female	94	64.8	100.0
<b>Marital status</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
Married	78	53.8	53.8
Single	7	4.8	58.6
Widowed	47	32.4	91.0
Divorced	13	9.0	100.0
<b>Education</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
Municipal	78	53.8	53.8
Gymnasium	14	9.7	63.4
Lyceum	19	13.1	76.6
After Lyceum	15	10.3	86.9
University	19	13.1	100.0
<b>Work status</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
Retired	122	84.1	84.1
Employee	9	6.2	90.3
Housework	14	9.7	100.0
<b>Type of work</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
Heavy manual	69	47.6	47.6
Moderate/Light manual	55	37.9	85.5
Non-manual	21	14.5	100.0
<b>Paid/unpaid assistant</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
Yes	46	31.7	31.7
No	99	68.3	100.0
<b>Financial status</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
Very poor	7	4.8	4.8
Poor	27	18.6	23.4
Moderate	65	44.8	68.3
Good	41	28.3	96.6
Very good	5	3.4	100.0
<b>Place of residence</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
Urban area	98	67.6	67.6
Suburban area	40	27.6	95.2
Rural area	7	4.8	100.0
<b>Insurance</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>

Public	138	95.2	95.2
Private	2	1.4	96.6
Both of them	5	3.4	100.0

**Table 2.** Frequencies of sociodemographic characteristics

Regarding clinical characteristics, the majority of the participants had no comorbidity (99.3%), were taking medication (100.0%), and presented somewhat serious musculoskeletal problem status (46.2%) (Table 3).

<b>Comorbidity</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
Yes	1	0.7	0.7
No	144	99.3	100.0
<b>Taking medication</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
Yes	145	100.0	100.0
<b>Musculoskeletal problem status</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
Not at all serious	10	6.9	6.9
A bit serious	67	46.2	53.1
Pretty serious	53	36.6	89.7
Very serious	15	10.3	100.0

**Table 3.** Frequencies of clinical characteristics

In Table 4, descriptives of the questionnaires are presented. Specifically, the mean score of physical fatigue was 15.5, of mental fatigue 13.4, total fatigue 28.9, and SEAMS 41.6.



	FAS physical	FAS mental	FAS total	SEAMS total
N	145	145	145	145
Missing	0	0	0	0
Mean	15.5	13.4	28.9	41.6
Standard deviation	3.18	2.97	5.47	4.74
Minimum	8	5	15	24
Maximum	23	20	40	48

**Table 4.** Descriptives of the questionnaires

In Table 5, frequencies of levels of total fatigue were presented. In particular, the majority of patients answered that they were fatigued (105, 72.4%), 27 patients were extremely fatigued (18.6%), and 13 patients were not fatigued (9%).

FAS cut off points	Counts	% of Total	Cumulative %
non fatigued	13	9.0	9.0
fatigued	105	72.4	81.4
extremely fatigued	27	18.6	100.0

**Table 5.** Frequencies of FAS - cut off points

Also, the results indicated that all questionnaires had very good reliability. More specifically, the value of the FAS scale was 0.888 and of the SEAMS was 0.839.

In Table 6, results demonstrated that there was a statistically significant difference between patients

with different educational levels. Specifically, those with after lyceum education (post-secondary education) presented higher medication compliance compared to those who were gymnasium graduates ( $W=4.060, p=0.033<0.05$ ).

		W	p
Primary	Gymnasium	-2.984	0.216
Primary	Lyceum	-0.749	0.984
Primary	Post-secondary	2.855	0.257
Primary	Higher	-0.807	0.979
Gymnasium	Lyceum	1.762	0.725
Gymnasium	Post-secondary	4.060	0.033
Gymnasium	Higher	2.228	0.513
Lyceum	Post-secondary	3.013	0.207
Lyceum	Higher	0.229	1.000
Post-secondary	Higher	-3.333	0.127

**Table 6.** Pairwise comparisons in educational levels regarding SEAMS

In Table 7, results demonstrated that there were statistically significant differences between patients with different levels of severity regarding their musculoskeletal disorder. Specifically, those patients presenting pretty or very serious problems noted lower compliance in comparison to those with a bit serious problems ( $W=-4.47$ ,  $p=0.009<0.05$ ,  $W=-5.05$ ,  $p=0.002<0.05$ ).

		W	p
Not at all serious	A bit serious	1.09	0.868
Not at all serious	Pretty serious	-1.38	0.765
Not at all serious	Very serious	-2.76	0.208
A bit serious	Pretty serious	-4.47	0.009
A bit serious	Very serious	-5.05	0.002
Pretty serious	Very serious	-2.15	0.425

**Table 7.** Pairwise comparisons in severity of musculoskeletal disorder regarding SEAMS

In Table 8, results indicated that there was a statistically significant effect of physical and mental fatigue on the level of medication compliance.

Specifically, the results showed that those patients who were extremely fatigued expressed a lower level of compliance compared to those who were non-fatigued or fatigued.

		W	P
1 non-fatigued	2 fatigued	-0.220	0.987
1 non-fatigued	3 extremely fatigued	-3.328	0.049
2 fatigued	3 extremely fatigued	-4.598	0.003

**Table 8.** Pairwise comparisons in the level of fatigue regarding SEAMS

In table 9, we see the results from Post Hoc tests (ANOVA) comparing the level of compliance among 3 groups of patients with different level of fatigue. The results showed that patients who were extremely

fatigued presented lower compliance compared to those who were non fatigued ( $p=0.038$ ,  $M= 39.1$  versus  $42.4$ ). Further, patients who were extremely fatigued presented lower compliance compared to those who were fatigued ( $p=0.003$ ,  $M= 39.1$  versus  $42.1$ ).

Post Hoc Comparisons - FAS cut off points									
Comparison									
FAS cut off points		FAS cut off points	Mean Difference	SE	df	t	p		
1 <22 non fatigued	-	2 higher or equal to 22 fatigued	0.299	1.360	142	0.220	0.826		
	-	3 higher or equal to 35 extremely fatigued	3.274	1.561	142	2.096	0.038		
2 higher or equal to 22 fatigued	-	3 higher or equal to 35 extremely fatigued	2.975	0.998	142	2.980	0.003		
Note. Comparisons are based on estimated marginal means									
Estimated Marginal Means - FAS cut off points									
					95% Confidence Interval				
FAS cut off points			Mean	SE	Lower	Upper			
1 <22 non fatigued			42.4	1.283	39.8	44.9			
2 higher or equal to 22 fatigued			42.1	0.451	41.2	43.0			
3 higher or equal to 35 extremely fatigued			39.1	0.890	37.4	40.9			

**Table 9.** Post Hoc Tests comparing the level of compliance among 3 groups of patients with different level of fatigue

There was no statistically significant effect of the variables of gender, marital status, having an unpaid/paid assistant, financial status, place of residence, insurance, work status, type of work, or comorbidity on the level of medication compliance ( $p > 0.05$ ).

## Discussion

The aim of the present study was to investigate the sociodemographic (gender, education, marital status, having an unpaid/paid assistant, financial status, place of residence, insurance, work status, type of work), clinical (state of *musculoskeletal disorder*, *comorbidity*) as well as psychological (physical and mental fatigue) barriers to medication compliance among Greek patients with *musculoskeletal disorders*.

Sociodemographic, clinical and psychological factors seem to play a crucial role in these patients'

compliance.

*In particular, the research findings indicate that the role of psychological factors, such as fatigue, is very crucial as patients who are extremely fatigued express a lower level of compliance compared to those who are non-fatigued or fatigued. This finding is in agreement with other findings of similar studies indicating that the emotional state may affect the degree of compliance with treatment<sup>[19]</sup>. Theofilou<sup>[19]</sup> investigated the influence of depression on medication adherence among patients undergoing hemodialysis. The findings have demonstrated a negative association between level of medication adherence and depressive symptoms. Patients with depressive symptoms report greater feelings of hopelessness, compromising cognitive abilities.*

It is also demonstrated that there are significant differences between patients with different level of severity regarding their *musculoskeletal* disorder.

Specifically, those patients presenting pretty or very serious problem note lower compliance in comparison to those with a bit serious problem. It seems that the severity of the medical situation is a burden for these patients who are obliged to cope with it. This is not in line with other studies since researchers indicate that compliance is significantly positively correlated with patients' beliefs in the severity of the disease to be prevented or treated ("disease threat")<sup>[20]</sup>.

Moreover, it is demonstrated that there is a significant difference between patients with different educational levels. Specifically, those with after-lyceum education (post-secondary education) present higher medication compliance compared to those who are gymnasium graduates. The impact of the sociodemographics is of great importance according to other studies<sup>[19][21]</sup>, as we see differences regarding genders, ages, or educational levels. Based on them, interventions must be implemented to support these patients, and in particular those who are extremely fatigued and with a great severity of their problem.

## Conclusion

Tailored programs must be implemented in order to strengthen the level of medication compliance among patients with musculoskeletal disorders in Greece, particularly in those patients with lower educational levels, more fatigued, and more serious health problems.

Efforts should be made by caregivers to recognize, acknowledge, and respect the presence of physical and cognitive fatigue and the impact these fatigue domains have on the overall ability to comply with prescribed medications<sup>[5]</sup>. Moreover, fatigue is not usually considered to be a determinant of compliance; therefore, healthcare systems need to be more aware of the results of this study.

The present study has some limitations. Patients come from a specific Greek geographical region, which means that it is difficult for the results to be generalized in the wider population. Therefore, the need for future studies and further investigation of this topic is of great importance including a sample of participants that will be a more representative part of the wider population. Moreover, the impact of other variables on medication compliance may be also studied.

Despite its limitations, the present study demonstrates the importance of psychosocial factors

in understanding medication compliance of these patients. It is important for health professionals to identify and attempt to remove their patients' barriers to medication self-management and optimal medication compliance. Health staff can impact patient satisfaction with care and include patients as active team members in order to identify barriers to medication compliance and to create individualized care plans for patients.

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## References

1. <sup>a, b</sup>Haynes R, Taylor D, Sackett D. *Compliance in Healthcare*. Baltimore: John Hopkins University Press; 1979.
2. <sup>Δ</sup>Horne R. *Compliance, Adherence and Concordance*. Pharmacy Practice. New York: Taylor and Francis; 2001. p. 148-166.
3. <sup>Δ</sup>Kikira A, Tsami A. *Adherence to Treatment in Patients with Heart Failure*. Perioperative Nursing. 2017;6(1):31-44.
4. <sup>a, b, c, d</sup>Jimmy B, Jose J. *Patient Medication Adherence: Measures in Daily Practice*. Oman Medical Journal. 2011;26(3):155-159.
5. <sup>a, b</sup>Theofilou P, Anyfantopoulou E. *Fatigue and perceived social support contributing to medication adherence among elderly patients with musculoskeletal disorders in Greece*. Academia Medicine. 2024;1(3). doi:10.20935/AcadMed7296
6. <sup>Δ</sup>Sackett DL, Snow JC. *The Magnitude of Compliance and Non Compliance*. In: Haynes RB, Taylor DW, Sackett DL, editors. *Compliance in Health Care*. Baltimore: Johns Hopkins University Press; 1979. p. 11-22.
7. <sup>Δ</sup>Tebbi C, et al. *Compliance of Pediatric and Adolescent Cancer Patients*. American Cancer Society. 1986;58(5):1179-1184.
8. <sup>Δ</sup>Harris R, Linn W. *Health Beliefs, Compliance and Control of Diabetes mellitus*. South Med J. 1985;78(2):162-166.
9. <sup>a, b</sup>Luga AO, McGuire MJ. *Adherence and Health Care Costs*. Risk Management and Healthcare Policy. 2014;7:35-44.

10. <sup>a, b</sup>Kanavaki AM, Rushton A, Efstathiou N, Alrushud A, Klocke R, Abhishek A, Duda JL. Barriers and facilitators of physical activity in knee and hip osteoarthritis: a systematic review of qualitative evidence. *BMJ Open*. 2017 Dec 26;7(12):e017042. doi:10.1136/bmjopen-2017-017042. PMID 29282257; PMCID PMC5770915.
11. <sup>a, b</sup>Bennell K, Dobson F, Hinman R. Measures of Physical Performance Assessments: Self-Paced Walk Test (SPWT), Stair Climb Test (SCT), Six-Minute Walk Test (6 MWT), Chair Stand Test (CST), Timed Up & Go (TUG), Sock Test, Lift and Carry Test (LCT), and Car Task. *Arthritis Care & Research*. 2011;63:S350-S370. doi:10.1002/acr.20538
12. <sup>a, b</sup>Tsiamis G, Alikari V, Fradelos E, Papapetrou S, Zyga S. Assessment of quality of life and fatigue among haemodialysis patients. *Am J Nurs Sci*. 2015;4:66-73.
13. <sup>^</sup>Michielsen HJ, De Vries J, Van Heck GL. Psychometric qualities of a brief self-rated fatigue measure: The Fatigue Assessment Scale. *J Psychosom Res*. 2003 Apr;54(4):345-52. doi:10.1016/s0022-3999(02)00392-6. PMID 12670612.
14. <sup>^</sup>Michielsen HJ, De Vries J, Drent M, Peros-Golubicic T. Psychometric qualities of the Fatigue Assessment Scale in Croatian sarcoidosis patients. *Sarcoidosis Vasc Diffuse Lung Dis*. 2005 Jun;22(2):133-8. PMID 16053029.
15. <sup>^</sup>Nordin Å, Taft C, Lundgren-Nilsson Å, Dencker A. Minimal important differences for fatigue patient reported outcome measures—a systematic review. *BMC Med Res Methodol*. 2016 May 26;16:62. doi:10.1186/s12874-016-0167-6.
16. <sup>^</sup>Risser J, Jacobson TA, Kripalani S. Development and psychometric evaluation of the Self-efficacy for Appropriate Medication Use Scale (SEAMS) in Low-Literacy patients with chronic disease. *J Nurs Meas*. 2007;15(3):203-19.
17. <sup>^</sup>Theofilou P. Self-Efficacy for Appropriate Medication Use Scale (SEAMS): translation and cultural adaptation in Greece. *Series Clin Med Case Rep Rev*. 2023; 1(3):1-4.
18. <sup>^</sup>Theofilou P, Psillaki A. The Self – Efficacy for Appropriate Medication Use Scale (SEAMS) – Evaluation of Its Psychometric Properties Among Greek Chronic Disease Patients: A Pilot Study. *JNurs Care Repo*. 2024;5(1):1-6.
19. <sup>a, b, c</sup>Theofilou P. Medication adherence in Greek hemodialysis patients: the contribution of depression and health cognitions. *Int J Behav Med*. 2013 Jun;20(2):311-8. doi:10.1007/s12529-012-9231-8. PMID 2407452.
20. <sup>^</sup>DiMatteo MR, Haskard KB, Williams SL. Health beliefs, disease severity, and patient adherence: a meta-analysis. *Med Care*. 2007 Jun;45(6):521-8. doi:10.1097/MLR.0bo13e318032937e. PMID 17515779
21. <sup>^</sup>Theofilou P. Treatment adherence of diabetes mellitus patients: Is it affected by demographic and patient-related factors? A literature review. *Academia Medicine*. 2023;1. doi:10.20935/AcadMed6108.

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