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Development and Psychometric Testing of the Turkish-Version Oral Chemotherapy Adherence Scale

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ABSTRACT

Background: To ensure the quality of patient care, the bioavailability of drugs, and the success of the treatment, it is imperative that nurses evaluate the adherence of patients to pharmaceutical treatments using standard measurement tools that are integrated into the treatment process. No scale that uses psychometric analyses to evaluate this adherence in patients who are on oral chemotherapy is currently available.

Purpose: This study developed and tested the validity and reliability of a Turkish version of the standardized Oral Chemotherapy Adherence Scale (OCAS), a tool that may be used by healthcare personnel to better evaluate patient adherence to their therapies.

Methods: We developed and examined the validity and reliability of the OCAS using a sample of 306 patients with cancer who were receiving oral chemotherapy. A literature review was conducted to generate the items. An expert panel evaluated content validity; preimplementation was used to evaluate face validity, factor analysis was used to evaluate construct validity, and criterion validity was evaluated using the Medication Adherence Self-Efficacy Scale.

Results: The Cronbach's alpha calculated for OCAS (19 items) was .738. A highly significant and positive correlation was observed between the test–retest scores of the participants. A positive significant correlation was observed between the total scores of the participants obtained from OCAS and Medication Adherence Self-Efficacy Scale. As a result of the factor analysis performed for the construct validity of the scale, three factors were defined that accounted for approximately 43% of the total variance.

Conclusions/Implications for Practice: The OCAS has acceptable psychometric properties and is appropriate for use in research and clinical practice settings to evaluate patient adherence to their therapies.

KEY WORDS:
oral chemotherapy, treatment adherence, scale development, psychometric testing.

Introduction

According to GLOBOCAN 2012, an estimated 14.1 million new cancer cases and 8.2 million cancer-related deaths occurred in 2012, compared with 12.7 and 7.6 million, respectively, in 2008. Projections based on the GLOBOCAN 2012 estimates predict a substantive increase to 19.3 million new cancer cases per year by 2025 because of the growth and aging of the world population. More than half of all cancers (56.8%) and cancer deaths (64.9%) in 2012 occurred in less developed regions of the world, and these proportions will increase further by 2025 (cited in Ferlay et al., 2013). The Turkish Ministry of Health reported that there were approximately 200,000 cancer cases in Turkey in 2006. In addition, cancer-related deaths are the second leading cause of death after heart disease, accounting for approximately 15% of all deaths nationwide (Mollahaliloglu, Basara, & Eryilmaz, 2010).

Oral chemotherapy has become increasingly important in cancer treatment. Pharmaceutical companies continue to investigate the development of oral drugs, with approximately one quarter of all antineoplastic drugs in the developmental process being produced as oral agents (Moore, 2007). The use of oral chemotherapy among patients with cancer has numerous advantages for both patients and healthcare personnel (Bedell, 2003; Birner, 2003; Catania et al., 2005; Decker et al., 2009; Fallowfield et al., 2006; Findlay, von Minckwitz, & Wardley, 2008; Moore, 2007; Regnier Denois et al., 2011). However, nonadherence to therapy has been reported as a major problem in oral chemotherapy treatments (Borner, Scheithauer, Twelves, Maroun, & Wilke, 2001; Decker et al., 2009; Findlay et al., 2008; Moore, 2007; Oakley, Johnson, & Ream, 2010; Regnier Denois et al., 2011; Winkeljohn, 2007). Adherence has been defined as "the extent to which

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an individual's behavior (with regard to receiving medication, following diets, or executing lifestyle changes) coincides with healthcare advice" (DiMatteo, 2004; Osterberg & Blaschke, 2005). Nonadherence begins with patients choosing not to attend a checkup or not to follow the recommendations of their physician because of the adverse effects of the therapy. Nonadherence may take the form of dose reduction or a refusal to take the prescribed pills entirely. The reasons for nonadherence include factors such as complicated treatment plans, insufficient communication with the health personnel, insufficient social support, the adverse effects of drugs, and adverse drug interactions (Aisner, 2007; DiMatteo, 2004; McCue, Lohr, & Pick, 2014; Moore, 2007; Partridge, Avorn, Wang, & Winer, 2002).

For the past few years, oral anticancer drug use has increased in the oncology community as many new oral agents have received approval and support. As a result, patients must now assume greater responsibility for filling prescriptions from retail and specialty pharmacies and for implementing complex dosage regimens in addition to self-monitoring symptoms, side effects, and adverse events. Patients may take 5–12 pills two-to-three times daily with confusing schedules such as 2 weeks on, 1 week off, and 2 more weeks on. In most cases, patients are prescribed with these drugs for extended periods, and in some instances, these agents may be prescribed for the rest of the patient's life (Decker et al., 2009).

Studies directed toward determining the adherence of patients with cancer to therapy have reported many different degrees of adherence as well as many factors that affect adherence (Cin, 2009; Decker et al., 2009; Gönderen, 2009; Partridge et al., 2002; Tokdemir, 2011; Winterhalder et al., 2011). Partridge et al. (2002) reviewed the studies published between 1980 and 2001 on adherence among patients with cancer who receive oral therapy. The review concluded that adherence varied from 20% to 100% and that the techniques used to evaluate adherence had not been well defined. Beyond those studies reviewed by Partridge et al., three studies on patient adherence to oral chemotherapy have been carried out in Turkey. These studies identified the rate of adherence to range from 37% to 90% (Cin, 2009; Gönderen, 2009; Tokdemir, 2011).

The conceptual framework used for this study is Cox's Interaction Model of Client Health Behavior (IMCHB). The three major elements of the IMCHB are client singularity (affective response, cognitive appraisal, and intrinsic motivation), client–professional interaction, and health outcome. As the primary objective, the IMCHB purports to identify and explain the relationships between the three major elements (Cox, 1982; Mathews, Secrest, & Muirhead, 2008). According to the literature, key elements in adherence include (a) the existence of an agreement between the client and the healthcare provider, (b) the client's freedom to decide whether to adhere to the recommended health regimen, and (c) no blame if the client fails to adhere the healthcare provider's recommendations (Horne et al., 2005). This model was chosen because it consists of a concept that is related to adherence.

Adherence is not a biological factor that affects the physiology of a patient. However, nonadherence is an important factor that negatively affects the success of therapy. Poor adherence to medication is an ever-present and complex problem that substantially undermines disease control and quality of life. In addition, poor medication adherence increases the systemic costs of healthcare (Hawwa et al., 2009). Thus, a patient's adherence to therapy is as important as the accurate diagnosis and treatment of the disease (Abula & Worku, 2001; Osterberg & Blaschke, 2005; Partridge et al., 2002). It has been reported that nurses are very important in ensuring patient adherence to therapy (Erdemir, 2005; Gerbrecht & Kangas, 2004; Gönderen, 2009; Kav et al., 2010). To fulfill this responsibility, nurses must first determine the factors that affect the medication adherence of patients. In doing this, it is extremely important to reveal the findings objectively. With regard to the quality of patient care, the bioavailability of the drug, and the success of the treatment, it is imperative that nurses evaluate adherence using standard measurement tools that are integrated into the treatment process. "There is no specific and standard scale to evaluate adherence among patients receiving oral chemotherapy that has been tested for psychometric properties." Therefore, using the data collected in this study, our research team evaluated patients' adherence to treatment, which is an important issue in terms of oral chemotherapy and the deficiencies in adherence.

This study developed and tested the validity and reliability of the Turkish-version standardized Oral Chemotherapy Adherence Scale (OCAS), an instrument designed to help healthcare personnel better evaluate the therapy adherence of patients.

Methods

Design, Sample, and Setting

An instrument validation study was designed to assess the adherence status of patients receiving oral chemotherapy. The sample size was calculated using the formula Item number × Patient number, with 10–30 patients required for each item in the scale (Guadagnoli & Velicer, 1988; Nunnally, 1978). Therefore, the sample size needed to include at least 10 patients for each item of the scale (24 items × 10 patients = 240). Three hundred six patients were subsequently enrolled as participants.

Before participation, patients were required to meet the following inclusion criteria: (a) diagnosed with cancer and taking oral antineoplastic agents for at least 1 month, (b) willing to participate, (c) aged over 18 years, and (d) able to communicate in Turkish.

This multicenter study was conducted in the oncology and hematology departments of four different hospitals in Ankara, Turkey, from April 2011 to March 2012. The ethics committee of each hospital and the Health Ministry in Ankara approved this study. Furthermore, before data collection, participants were informed about the study and asked to sign informed consent. The researcher guaranteed patients that

their identities and answers would be kept confidential. Completed questionnaires were stored securely. The first author used face-to-face interviews that took approximately 20–25 minutes each to gather the data.

To evaluate the test–retest reliability, 122 patients answered the OCAS questionnaire a second time, 2–4 weeks after the first application. The patients who came to the hospital for treatment or control during this period were selected for the retest.

The Oral Chemotherapy Adherence Scale Development Process

Item generation, item selection, and content validity

A literature review was conducted to determine the items that were appropriate for inclusion in the scale. This review identified major topics, including complex dosage regimens, forgetfulness, side effects of the medicine, motivational levels, socioeconomic characteristics, physical limitations/performance status, ability to tolerate oral medications with respect to swallowing, absorption, gastrointestinal function, and to take responsibility for the implementation of treatment of patients and their family affect adherence to oral chemotherapy (Aisner, 2007; Borner et al., 2001; Chen, Chen, Huang & Chang, 2014; Cin, 2009; DiMatteo, 2004; Fallowfield et al., 2006; Gönderen, 2009; Moore, 2007; Osterberg & Blaschke, 2005; Partridge et al., 2002; Regnier Denois et al., 2011; Tokdemir, 2011; Winkeljohn, 2007). The literature yielded an item pool of 32 items, 17 of which were positive and 15 of which were negative. The researchers and a Turkish language specialist checked the items and then created the framework for the proposed scale. The researchers consulted 17 specialists, including six medical oncologists, four nurses in the oncology department, and six teaching nurses experienced in the field of oncology, to verify the usefulness of the item pool. A specialist evaluation form was used for obtaining these opinions and was delivered to the experts either by hand or e-mail. They were asked to evaluate the items as "necessary"(this item can clearly measure the specified property), "useful but insufficient" (this item is in the context of the subject but should be arranged or changed), or "unnecessary" (the item does not represent the specified property). After receiving the experts' answers, the researchers calculated the content validity ratio (CVR) for each item in the item pool using the following formula (Grant & Davis, 1997; Şencan, 2005):

$$CVR = \frac{N_e - N/2}{N/2}$$

where N_e is the number of specialists who chose the "necessary" option and N is the total number of specialists.

Items yielding a CVR value of zero or less were removed from the scale. For those with a positive score, only those with a level of significance of $\alpha = .05$ or greater were retained to simplify calculations. Accordingly, the minimum CVR was calculated as .49, and items with a CVR score lower than .49 were excluded from the scale. This criterion excluded seven items from the scale, leaving the final scale with 25 items. Finally, the researchers calculated the scale's content validity index (CVI), with the content validity of the scale considered statistically significant for situations in which CVI ≥ CVR or CVI / CVR ≥ 0 (Cam & Arabaci, 2010). The formula CVI = Σ CVR / Item number was used to calculate the CVI (Şencan, 2005), which turned out to be .90 for 25 items.

Therefore, the content validity of the scale was found to be statistically significant, with a result of .90 (CVI) ≥ .49 (CVR) or .90 (CVI) / .49 (CVR) ≥ 0.

Face Validity

Preimplementation was performed with 30 participants to evaluate the face validity of the scale. During preimplementation, the patients were asked to comment on the comprehensibility of the items and whether they encountered problems in answering the questions. The context of some of the statements was reassessed, and some modifications were made based on these comments. For instance, the statement "When I run out of my drug, I visit my doctor and ask him to prescribe the same drug" was replaced by "I ask my doctor/nurse what to do when I run out of my drug" (Item 13). As another example, the statement "I get my prescribed drugs from the pharmacy easily and on time" was replaced by "I get my prescribed drugs from the pharmacy on time" (Item 14). Furthermore, the statement "If I vomit just after having taken the drug, then I take a second one" was left unanswered by most of the patients in the preimplementation group, because none of them experienced vomiting. Therefore, this statement was removed from the scale. After preimplementation, one more item was excluded, reducing the number of items to 24. The data obtained from the 30 patients in the preimplementation group were excluded from the main data pool.

Item Analysis and Psychometric Testing

The researchers conducted an item analysis using a correlation-based item analysis method. The formula "the corrected item minus the total score coefficient of correlations (item minus the remaining coefficient of correlation)" was calculated for the items in the correlation-based item analysis. When the coefficient displayed a value < .20 and the item was subsequently excluded from the scale, the increase in the scale's Cronbach's alpha value was accepted as a criterion for excluding the item from the scale (Şencan, 2005; Tavşancıl, 2010).

Psychometric Testing of the Scale

Reliability of the scale

The internal consistency and test–retest reliability were evaluated.

Validity of the scale

The content validity, face validity, criterion validity, and construct validity of the OCAS were evaluated. The content and the surface validity were explained in the section of The OCAS Development Process.

Statistical Analysis

The outcomes were expressed as numbers and percentages for the numerical variables and as mean ± standard deviation for the measurement variables. The Pearson correlation coefficient was calculated for the correlation-based item analysis, and the Cronbach's alpha value was calculated for the reliability analyses. Furthermore, in the test–retest analyses, the paired sample test was performed, and the correlation coefficient was calculated. For the validity analyses of the scale, the CVR and CVI were calculated to determine content validity. The Pearson correlation coefficient was used to evaluate criterion validity, and the descriptive factor analyses used the principal components analysis and Equamax Rotation to evaluate construct validity. The Kaiser–Meyer–Olkin (KMO) test was used before factor analysis. The SPSS package program for Windows Version 15.00 (SPSS, Inc., Chicago, IL, USA) was used in the statistical evaluation of the data. A $p < .05$ was considered statistically significant.

Results

Sample Characteristics

The mean age of the 306 participants was 54.64 ± 13.02 years. Nearly half (47.7%, n = 146) of the participants were between 45 and 64 years old, 70.3% were women (n = 215), 58.2% (n = 178) were primary school graduates, and 89.5% (n = 274) lived in a city center. Furthermore, 43.7% (n = 134) of the participants had breast cancer, and 41.3% (n = 126) had gastrointestinal system cancer. Half (50.3%, n = 154) had received their disease diagnosis within 2 years before the survey, 60.8% (n = 186) had metastasis, and 70.9% (n = 217) were receiving both intravenous and oral chemotherapy at the time of the study (Table 1).

The descriptive data related to the participants' oral chemotherapies are shown in Table 2. Most of the participants (75.8%, n = 232) had been using "capecitabine" tablets as the oral agent for their cancer treatment, and 75.5% (n = 231) had been prescribed their drug therapy for 1–6 months. In addition, 75.8% (n = 232) had been prescribed 14 days on/7 days off drug intake cycles, 21.4% (n = 65) had used drugs daily, 1.9% (n = 6) had been prescribed 1 day on/21 days off drug intake cycles, and 0.9% (n = 3) had been prescribed 10 days on/28 days off drug intake cycles.

TABLE 1.
Characteristics of the Study Participants (N = 306)

Characteristic	*n*	%
Age (years; *M*, *SD*)	54.6	13.0
18–45	85	27.8
46–64	146	47.7
65 and older	75	24.5
Gender		
Female	215	70.3
Male	91	29.7
Educational status		
Illiterate	36	11.8
Primary school	178	58.2
High school and higher	92	30.0
Place of residence		
City	274	89.5
District	32	10.5
Diagnosis		
Breast cancer	134	43.7
Gastrointestinal tract cancers[a]	126	41.3
Lung cancer	12	3.9
Genitourinary system cancer	10	3.2
Hematologic cancers[b]	16	5.2
Gynecologic cancers	2	0.7
Sarcoma	6	2.0
Duration of disease (years)		
0–2	154	50.3
3–5	102	33.3
6 and more	50	16.4
Metastasis		
Yes	186	60.8
No	120	39.2
Treatment		
Only oral chemotherapy	89	29.1
IV chemotherapy + oral chemotherapy	217	70.9

Note. Age ranges from 21 to 82 years. IV = intravenous.
[a]Colon, rectum, stomach, esophageal, pancreatic cancer, and GIST.
[b]Chronic myeloid leukemia, multiple myeloma, and acute myelofibrosis.

Results of the Psychometric Testing

Item analysis

Table 3 shows the corrected item–total score correlation coefficients (the item minus the remaining correlation coefficient) for the items in the OCAS scale as well as the Cronbach's alpha values after the aforementioned items were removed from the scale. According to the data in Table 3, the corrected item–total score correlation coefficients of the 11th (.127), 13th (−.044), 14th (.073), 15th (.180), 19th (.084), 22nd (−.010), and 24th (.162) items were below .20. After Items 15 and 24 were removed, the Cronbach's alpha value decreased, despite the correlation coefficients of these items being below .20. Because of these results, the 11th, 13th, 14th, 19th, and 22nd items were also excluded from the scale. It was decided that the 15th and 24th items should remain because these were associated with a decrease in the value of the Cronbach's alpha.

Reliability Results for the Oral Chemotherapy Adherence Scale

Internal consistency

The Cronbach's alpha coefficient for the 24 items after the trial application was .702. After removing the five items from the scale, the Cronbach's alpha coefficient for the remaining 19 items was .738.

TABLE 2.
Descriptive Data Related to the Oral Chemotherapies of the Participants

Feature	*n*	%
Drug		
Capecitabine	232	75.8
Imatinib	16	5.2
Sunitinib	14	4.6
Etoposide	14	4.6
Hydroxyurea	6	2.0
Vinorelbine	6	2.0
Diğer[a]	18	6.0
Duration of drug use (months)		
1–6	231	75.5
7–12	51	16.7
13 and above	24	7.8
Drug use		
14 days of drug use + 7 days of rest cycles	232	75.8
Continuous daily drug	65	21.4
1 drug use + 21 days rest	6	1.9
10/28 days of drug use cycles	3	0.9
Daily use of the drug		
Only in the morning or in the evening	58	19.0
Morning and evening	240	78.4
Morning–afternoon–evening	8	2.6

Note. [a]Lapatinip, siklofosfamid, temozolomid, dasatinib, lenalidomid, lomustine, and/or procarbazine.

Test–retest reliability

According to the data obtained in the retest, the Cronbach's alpha value was .735 for the 24-item scale and .790 for the 19-item scale. The means of the total scores obtained in the first test and the retest on 122 participants were 90.72 ± 6.20 (first test) and 90.89 ± 5.81 (retest), and no significant difference was observed between these two scores (t = 1.149, p = .253). In the correlation analysis performed for the test–retest reliability, a highly statistically significant and positive correlation was observed between the first test scores and the retest scores (r = .974, p < .001).

Validity Results for the Oral Chemotherapy Adherence Scale

The findings regarding the content and face validity have been explained in the section of The OCAS Development Process.

Criterion validity

Medication Adherence Self-Efficacy Scale (MASES) was employed to evaluate criterion validity. For this purpose, OCAS and MASES were performed on 100 participants in this study. The researchers calculated the correlation coefficient between the total scores obtained in the OCAS scale and the total scores obtained in the MASES scale. To ensure the scale's criterion validity, the correlation coefficient was required to have a minimum value of .30 (Şencan, 2005; Tavşancıl, 2010). MASES, developed by Ogedegbe, Mancuse, Allegrante, and Charlson (2003), is a 24-item scale that assesses the confidence of patients in their ability to take their antihypertensive medications in a variety of situations. Examples of such situations include "when busy at home," "while at work," and "when they cause some side effects." The items were scored from 1 = *not sure at all* to 4 = *very sure*, and the total score on the measure was computed by averaging the responses to all of the items. Higher scores indicate a greater level of self-efficacy. MASES does not include subscales. Gozum and Hacihasanoglu (2009) performed validity and reliability studies of MASES using Turkish patients with hypertension. Furthermore, Tokdemir (2011) adapted the scale for Turkish patients undergoing oral chemotherapy, finding a Cronbach's alpha value of .82. These studies indicated that known group validity (e.g., patients with controlled blood pressure had higher mean self-efficacy scores than those with uncontrolled blood pressure in Gozum and Hacihasanoglu's

TABLE 3.
The Results of Item Analysis (N = 306)

Item	Scale Mean Score if Item is Deleted	Scale Variance if Item is Deleted	Corrected Item–Total Correlation	Cronbach's Alpha if Item is Deleted
Item 1	108.6993	35.142	.432	.687
Item 2	108.7876	35.106	.310	.690
Item 3	108.8366	32.878	.511	.672
Item 4	108.6863	35.344	.287	.692
Item 5	108.8758	33.244	.433	.677
Item 6	108.6732	35.952	.214	.696
Item 7	109.6961	31.740	.336	.685
Item 8	108.7582	34.551	.317	.688
Item 9	108.7255	35.931	.225	.696
Item 10	108.6863	35.409	.321	.691
Item 11	109.2810	35.081	.127	.706
Item 12	109.0196	34.924	.210	.696
Item 13	108.6993	37.254	−.044	.712
Item 14	108.8366	36.117	.073	.707
Item 15	108.8693	35.793	.180	.698
Item 16	109.1307	30.212	.415	.675
Item 17	108.6993	35.260	.326	.690
Item 18	109.2288	29.980	.365	.684
Item 19	108.7582	36.243	.084	.705
Item 20	108.8660	34.628	.248	.693
Item 21	108.9739	32.793	.364	.681
Item 22	108.6732	37.185	−.010	.706
Item 23	108.6471	35.777	.472	.691
Item 24	108.8725	35.567	.162	.700

Note. Cronbach's alpha = .702. Mean ± *SD* = 113.60 ± 6.10.

study) and content validity (e.g. the content validity was calculated .76 in Tokdemir's study) were adequate for MASES (Gozum & Hacihasanoglu, 2009; Tokdemir, 2011).

The results of this study indicated a significant and positive correlation between the scores for OCAS and MASES (r = 323, $p < .001$).

Construct validity

The KMO value was found to be .659, with a Bartlett's test outcome of 1697.214 and a p value of <.01. The factor analysis identified three factors that accounted for 43% of the total variance, with an eigenvalue of >1. Table 4 shows the factor analysis outcomes, with 22% of variance explained by the first factor, 11% explained by the second, and 10% explained by the third. The factor loading assessment of the items showed differing values, varying between .309 and .825. According to the factor analysis outcomes, the 1st, 3rd, 4th, 5th, and 8th items formed the first factor; the 2nd, 9th, 10th, 16th, 17th, 18th, 20th, 21st, and 23rd items formed the second factor; and the 6th, 7th, 12th, 15th, and 24th items formed the third factor. The Cronbach's alpha coefficients calculated for each factor after the factor analysis were as follows: .716 for the first factor, .674 for the second factor, and .414 for the third factor (Table 4). Finally, the factors were named by examining the items under each factor title. The first factor was named "expected behaviors related to the treatment period," the second factor was named "barriers," and the third factor was named "expected behaviors during drug use."

Discussion

A scale should have the two properties of reliability and validity to be standardized and to subsequently produce proper information (Çam & Arabaci, 2010; Ercan & Kan, 2004). This study tested the reliability and validity of the OCAS to investigate whether the scale could be used as a standard measurement instrument.

TABLE 4.
Result of Exploratory Factor Analysis Showing the Internal Structure of OCAS

Item No.[a]	Item	Factor Loading		
		Factor 1	Factor 2	Factor 3
1.	I use my oral cancer drugs regularly as described by my doctor/nurse.	.825		
3.	There are times that I willingly do not use my drugs if they cause side effects.	.721		
4.	I am late in getting new drugs when I run out of them.	.719		
5.	When I go to a health center for any complaint, I tell the doctor/nurse that I use cancer drugs.	.314		
8.	I use my drug doses as prescribed by my doctor without disruption.	.672		
2.	I disrupt using my drugs if I do not remember the timing of them.		.658	
9.	I disrupt my drug doses because of daily activities.		.607	
10.	I may disrupt taking my drugs because I have to take many drugs daily.		.613	
16.	The side effects of the drugs do not interfere with my use.		.507	
17.	I disrupt regularly taking my drugs because the timing of the doses are complicated.		.460	
18.	If I forget taking my drugs on time, then I take them when I remember.		.643	
20.	I disrupt taking my drugs if I am out, such as on vacation.		.309	
21.	I find it difficult to visit the doctor for my prescription.		.657	
23.	I disrupt taking my drugs because I feel uncomfortable because of using drugs continuously.		.326	
6.	I use my drugs without breaking or chewing them.			.451
7.	I wash my hands after touching the drugs.			.515
12.	I am careful about the keeping conditions of the drugs.			.378
15.	I report the side effects of my drugs to my doctor/nurse.			.588
24.	I take my drugs in accordance with the timing of my meals.			.539
Eigenvalue		4.108	2.182	1.871
Percentage of variance explained		21.619	11.482	9.846
Accumulative percentage of variance explained		21.619	33.101	42.947
Cronbach's α		.716	.674	.414

Note. OCAS = Oral Chemotherapy Adherence Scale.
[a]Items 11, 13, 14, 19, and 22 have been eliminated after the item analysis.

This study investigated the reliability of OCAS to show that it could work independently from the patients, that it could collect the data on time, that it showed no variation in time, and that it could be repeated (Çam & Arabaci, 2010; Şencan, 2005). The Cronbach's alpha coefficient for the 19-item scale was .738, which suggests that the OCAS is reliable. The test–retest reliability analyses also showed that OCAS has yielded consistent outcomes and has ensured the test–retest reliability.

On the basis of the results of item analysis, Items 11, 13, 14, 19, and 22 were excluded from the scale. Despite the retention of these items by the expert panel, the item analysis indicated that these items were inadequate for retention in the scale. The association of the content of the items in the scale with the analyzed concept during the scale development process was an important issue, and the results of analyses performed for these items being within the acceptable limits for a standard measurement instrument was used as an important criterion (Çam & Arabaci, 2010; Şencan, 2005). When the contents of the items excluded as a result of item analysis in this study were examined, it was observed that the remaining 19 items adequately incorporated or expressed the content of these items. Furthermore, the increase of the Cronbach's alpha value calculated for OCAS as a result of the excluded items provided added support for the exclusion. Thus, the items excluded by the item analysis did not weaken the OCAS.

A scale's validity determines its appropriateness for measuring the target phenomenon. Thus, this study investigated the appropriateness of the measurement according to the rules and in consideration of how well the measurement data reflected the stated property (Büyüköztürk, 2011; Çam & Arabaci, 2010; Şencan, 2005; Tavşancıl, 2010). Fidanci et al. (2012) mentioned that content, face, criterion, and construct validity analyses should be performed for validity analysis in Likert-type scales. The validity evaluation of the developed scale in this study was conducted using content validity, face validity, criterion validity, and construct validity analyses.

The content validity was investigated to determine whether the items involved in the OCAS adequately represented the target phenomenon (Büyüköztürk, 2011; Çam & Arabaci, 2010; Şencan, 2005; Tavşancil, 2010). At the end of the content and face validity analyses performed for the initial 32-item scale, eight items were eliminated, and the validities were provided.

In the criterion validity analysis, a positive significant correlation was observed between the OCAS and MASES scores ($r = 323$, $p < .001$). A correlation coefficient of >.30 between OCAS and MASES indicates a valid criterion analysis. The factor analysis method was used to evaluate the construct validity of the scale. To use the factor analysis method in a scale development study, the sample size must meet the predefined criteria. There are different rules in the literature with respect to sample sizes. Two of these rules are the KMO and the Bartlett's test. To be defined as a good factor analysis, the KMO requires an index score of >.60, and the Bartlett's test must be statistically significant (Büyüköztürk, 2011; Şencan, 2005). The KMO value for this study of >.60 and the statistically significant Bartlett's test ($p < .001$) indicated that the sample size used was sufficient to perform a factor analysis. In the factor analysis performed to evaluate the construct validity of the OCAS, three factors were identified that accounted for approximately 43% of the total variance of the items in the scale (Table 4). The factor loadings of the items involved in the scale varied between .309 and .825. Although the factor loads of the 5th, 12th, 20th, and 23rd items were lower in comparison with the other items within the same factor, this was not deemed as a deficiency of the OCAS because the literature indicates that factor loads in factor analyses must be at least .300 (Büyüköztürk, 2011; Çam & Arabaci, 2010; Şencan, 2005; Tabachnick & Fidell, 1996). Therefore, the results related to factor loading show an adequate factor construction for the OCAS.

In addition to the numerical variables, the ability to gather the items together to form a meaningful whole is an important component in the evaluation and interpretation of factor analysis outcomes (Büyüköztürk, 2011). In this study, the numerical variables were acceptable, and the items could be gathered together to form a meaningful whole in the evaluation of the factor analysis. After determining a proper factor construction for the scale, factors were named by examining the items under each factor title. The first factor was named "expected behaviors related to the treatment period," the second factor was named "barriers," and the third factor was named "expected behaviors during drug use."

Adherence has been defined as "the extent to which an individual's behavior (with regard to receiving medication, following diets, or executing lifestyle changes) coincides with healthcare advice" (DiMatteo, 2004; Osterberg & Blaschke, 2005). Treatment-related definitions support the adherence behaviors of individuals as a basic factor of consideration. According to Roy, a nursing theoretician, human behavior is the result of adherence (Birol, 2002). On the basis of the definition of treatment adherence, we named two of the factors determined for OCAS as "expected behaviors during drug use" and "expected behaviors related to the treatment period." When the content of the items in these factors was examined, we found an association with the behaviors of individuals (Table 4). In the interpretation of scale scores, the high scores for the factors of "expected behaviors related to the treatment period" and "expected behaviors during drug use" indicate that the individual showed the expected behaviors during the treatment process and during drug use.

Factors such as forgetfulness, drug side effects, the required regular use of drugs, using many drugs during the day, and complicated treatment regimes throughout the treatment process all negatively affect treatment adherence (DiMatteo, 2004; Osterberg & Blaschke, 2005). In the literature, it has been reported that these factors negatively affect the treatment adherence of patients who receive oral chemotherapy (Decker et al., 2009). The factor analysis of items that prevent treatment adherence examined in this study accumulated in the same

factor (“barriers”) in a significant manner (Table 4). In the interpretation of scale scores, the high score obtained from the “barriers” factor indicates that the treatment adherence of the individual is good, despite factors preventing treatment adherence, and that these preventing factors did not influence drug usage.

Finally, a scale instruction manual was created for scale users. The instructions include information about the target user group, how scores are calculated, and how to interpret data.

Conclusions

The data obtained in this study support that OCAS is a reliable and valid scale for evaluating adherence among patients receiving oral agents in the treatment of cancer. In light of these results, our research team recommends the use of OCAS by healthcare personnel in hospitals and by researchers in scientific studies researching Turkish patients' adherence to oral chemotherapy treatment. This scale may also be used in other countries following the adjustment of the scale and the validity and reliability analyses to reflect different cultural contexts.

Furthermore, symptoms experienced in oral chemotherapy treatment related to the disease, treatment, and disease perception are known to impact treatment adherence. It is recommended that the relationship between treatment adherence and the factors that influence adherence be investigated using OCAS in the future.

Limitations

Although researchers recruited hematology departments as targets for this study, the data obtained from hematology patients were inadequate to be included in data analysis. Hence, new validation studies should be performed on patients who use oral chemotherapy to treat hematological cancers. Finally, although this study showed that OCAS is a valid and reliable scale for adult patients who use oral chemotherapy, the scale has not been validated on pediatric patients.

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