

Development of a Propensity to Self-Medicate with Over-the-Counter Medicines Scale (PSM-OTC)

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Abstract

Objective: To develop a valid and reliable scale to measure the public's propensity to self-medicate with OTC medicines.

Method: Propensity construct items were obtained from the literature and also created as new entities. Three experts reviewed the item pool for face validity. Internal consistency was assessed using Cronbach's alpha. Test-retest reliability was estimated using Pearson correlation coefficients (*r*), Intraclass Correlation Coefficients (ICC) and paired sample *t*-tests. Further test-retest reliability assessed the degree of change in responses in a subset of subjects from time 1 to time 2 (one month apart) for each item on the scale.

Results: From the pool, 16 items were assessed for applicability to the propensity construct. Factor Analysis identified four components and were labelled as purchase involvement, self-efficacy, awareness of care needed during self-medication, and the therapeutic usefulness of OTC medicines. The internal consistency of the 16-item scale was sufficient; overall alpha was 0.9 and each construct had an alpha of 0.7 to 0.8. Test-retest reliability coefficients (*r*) for the four components were reassuring, ranging from 0.4 to 0.5, while the ICC values ranged from 0.5 to 0.7. A paired sample *t*-test showed no statistically significant difference in the rating at the two iterations for each of the constructs, thereby suggesting good reliability of the data. Over 50% of respondents did not change their original response to the 7-point scales (strongly disagree (1) to strongly agree (7)) for 9 out of 16 items. Factor loading from Principal Component Analysis led to the reduction of the 16-items scale to a 15-item Propensity to Self-Medicate with OTC Medicines Scale.

Conclusion: The developed tool for measuring the propensity to self-medicate with OTC medicines showed acceptable performance of internal consistency and reliability. The scale may have research potential in assessing the self-medication propensity of different cohorts of society.

Keywords: over-the-counter medicines, consumer behaviour, propensity to self-medicate, construct development, scale validity and reliability

Background

Self-medication with over-the-counter (OTC) medicines is common practice. There are variations in the estimation of the global prevalence of this behaviour depending on the population and the medication types. According to a recent systematic review and meta-analysis, a prevalence rate of 67 percent was reported from a pool of studies from 2000 to 2018.¹ Prior experience and the minor nature of the illness led to self-medication.¹ A Swedish study on the attitude and sales of OTC medicines showed that 87 percent of participants used such an agent in the last 6 months.² Approximately 10 percent stated they used one at the first sign of illness. The prevalence of this behaviour is influenced by many factors, including the regulations impacting their sale and availability across nations.³ These numbers are, in part, reflective of the willingness (or propensity) of patients to use these agents for various ailments.

Evidence tends to support the consumer's ability to self-manage minor ailments with these medicines.⁴⁻⁶ OTC medicines are generally perceived as having low risk within society.^{7,8} An Australian study characterizing OTC medicine requests and consumer experiences showed that prior use and a higher level of education predicted the decision to directly request a product.⁹ In another, Taylor et al reported that Saskatchewan residents had a reasonable ability to assess minor ailments, based on when they would seek medical care for the problem.^{10,11}

However, there are also many reports that outline the problems patients experience during the use of OTC medicines.¹²⁻¹⁶ Two recent systematic reviews noted a worrisome impact of OTC misuse.^{12,15} One reported the overall prevalence as 16.2 percent for misuse, 2.0 percent were classified as abuse, and 7.2 percent classified as dependence.¹² Problematic use was associated with analgesics (with or without codeine), sedative antihistamines, and cough mixtures containing dextromethorphan. The other review highlighted adolescents and young adults as the most vulnerable group for OTC medicine misuse.¹⁵

Our understanding of consumer behaviour as it relates to this area has increased, but more is needed. For a larger study on the public's likelihood to seek information on OTC medicine, a

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measure of the propensity to self-medicate with OTC medicines was needed. The objective of this article is to describe the conceptualization, development, and validation of such a measure.

Propensity is the natural tendency or inclination to do something.¹⁷ The act of taking medicines for our ailments is a particularly interesting human trait. Wyke described three iterative models for the response to symptoms.¹⁸ The illness action model, first developed by Dingwall,¹⁹ showed different levels of human response to external stimuli and how actions are based on our interpretation of the situation according to experience and available information. Actions could be a dismissal of the situation, watchful waiting, self-treatment, or consultation with a formal health care provider. Other models involved the cognitive perception of the illness as an influence on problem-solving behavior²⁰ and the relevance of social networks to the recognition of, and response to, health problems.²¹

Factors contributing to this in relation to OTC medicines include knowing what agents might be available for any given condition, self-efficacy relative to using an agent and correctly assessing the illness, health literacy, the severity of the illness, the perceived effectiveness and risks associated with such therapy, and so on. A German study investigated why people engage in self-medication and found that most respondents did not want to see their physicians for minor issues.²² They noted long waiting times and limited opening hours at physician clinics as factors motivating this behaviour. In opting to engage in self-medication, the benefit of its inherent low cost (increased access and enhanced convenience) is weighed against the risk of incorrect self-diagnosis, incorrect dosing, side effects, and harmful drug interactions.²²⁻²⁶

Researchers have applied self-efficacy theory in various ways to help explain health-related behaviour. The Patient Activation Measure (PAM) was developed to assess patient self-reported knowledge, skill, and confidence in self-management of their health or chronic condition.^{27,28} Building on the development of PAM, self-efficacy may be relevant in the development of a Propensity to Self-Medicate Scale.

An additional examination of consumer propensity to self-medicate suggests that consumer need for control is a strong determinant.²⁹ This study suggested that consumers may be willing to be in charge of their health instead of depending on formalized health care channels. Specifically, the research noted that consumers with higher self-efficacy in their ability to control their health are more likely to engage in self-medication.²⁹

An awareness of the necessary precautions can influence any inclination for their use.^{30,31} Taylor et al created a six-item Awareness of Care Needed construct to assess this.³¹ In this scale, awareness required during OTC use included safety

issues, side effects, dosage limits, and the possibility of a drug interaction.

Method

An online survey was created to meet study goals and was composed of several sections. Participants were recruited through the Canadian Hub for Applied and Social Research (CHASR), a research agency at the University of Saskatchewan. CHASR recruited from a network of participants within Saskatchewan and invited them via email to participate in the electronic survey. This survey was conducted with Voxco survey software.

Construct Items

Items were extracted from various constructs identified in the literature and then reduced in numbers by the researchers via an iterative process.

The construct of Purchase Involvement was adapted from the work of Gore.³² Out of seven items originally used, four were selected for inclusion.

To create the construct of self-efficacy, four items were adapted from the self-efficacy constructs described by Kristjansson³³ and Hibbard.²⁸ Two items were taken from the Effective Consumer Scale (ECS)³³ and two from PAM.²⁸

The construct of Awareness of Care Needed during Self-Medication was represented by three items adapted from the works of Bradley,³⁴ Westerlund,³⁵ Azhar³⁶ and Taylor.³¹ A fourth item was created following a review of relevant publications on public OTC medicine risk perception.^{31,37,38}

To develop the construct of Therapeutic Usefulness of OTC Medicines, items were created to reflect the value of OTC medicines as a treatment option to consumers. These were based, in part, on Dave's conceptualization of technology acceptance,³⁹ Huston's work on patient intention to seek medication information from pharmacists,⁴⁰ Brabers' work on consumer confidence in OTC skills and attitudes,⁴¹ Taylor's work on consumer confidence and advice-seeking tendencies,⁹ and Rajamma's work on consumer propensity to self-medicate.²⁹

Sixteen items were grouped into four components felt to be indicative of propensity: purchase involvement, self-efficacy, awareness of the care needed during self-medication, and the therapeutic usefulness of OTC medicines. The strength in the public's belief in each statement relative to their approach to using OTC medicines was measured on a 7-point Likert scale (Strongly disagree (1) to Strongly agree (7)).

Internal Validity

Three experts in consumer behaviour and OTC medicine use assessed item choice and wording. They were tasked to determine if the statements suitably measure the corresponding construct and provide suggestions on improving item wording. Their judgment of suitability was dichotomized

to Yes or No, with the option to provide a detailed rationale for their input. The expert review was used, in part, to strengthen the validity of the scale and their qualitative feedback contributed to the modification of item wording.

Another aspect to enhance face validity was qualitative feedback from 20 purposely selected members of the public. They reported their experiences when completing the questionnaire in terms of the clarity and comprehension of item wording.

Internal Consistency and Reliability

Internal consistency of the scale was assessed using Principal Component Analysis (to generate factor loadings) and Cronbach's alpha. To measure the reliability of the 16-item construct, a test-retest procedure was performed. Test-retest reliability was measured by quantifying the degree of change in responses provided at initial survey introduction, then compared to the same survey instrument completed by the participant one month later. This estimate was done by selecting every tenth subject who completed the questionnaire for the broader study at times 1 and 2 (T1 and T2) until 20 valid respondents were obtained. Pearson correlation coefficient (r) was used to measure correlations.^{42,43} Intraclass Correlation Coefficient (ICC), which is more favored for reliability testing, was estimated using a two-way mixed effect model for consistency.⁴⁴⁻⁴⁶ Only the average ICC measure is reported.⁴⁴ Statistical significance is set at p value < 0.05 .

Data Collection

The Propensity to Self-Medicate with OTC Medicines measure (PSM-OTC) was one component in a broader study to assess the public's likelihood to seek information on such products, with a questionnaire used for that process.

Data were gathered from residents of Saskatchewan Canada via an online survey that was supported by the university's survey service. Saskatchewan has a population of 1,132,505.⁴⁷ A total of 384 responses were needed to meet a statistically defined margin of error (95% confidence interval \pm 5% error).⁴⁸ Assuming a response rate of 20 percent from 3000 residents, 600 valid responses were anticipated. The study was approved by the ethical review board of the University of Saskatchewan in October 2021.

To pilot test the questionnaire, 100 residents of the province were contacted, of which 14 valid responses were received. Minor adjustments were made to the instrument. The survey was then introduced to 3000 residents of Saskatchewan in December 2021 and the Voxco software links were sent to their email addresses. Data collection ended four weeks after commencement, with no reminders used. A month after completion of the first survey, the same questionnaire was sent again to respondents to assess the consistency of their responses.

Results

Expert Review Outcome

Three experts rated the 16 items and provided feedback on the suitability of each item wording for the construct being measured. Table 1 shows the inter-rater agreement. Each expert suggested modifications to the construct wording, with some (but not all) enacted. The 16 items received a total inter-rater aggregate percentage score of 83.5 percent.

Demographic characteristics of respondents

A total of 575 responses were obtained, garnering a response rate of 19.2 percent. A total of 212 valid responses were obtained to allow for test-retest assessment. The mean age of respondents was 63 years, with the majority being female (61.6 percent) and 55 percent of the respondents had a university degree.

Measures of Internal Consistency

The Principal Component Analysis of the PSM-OTC scale showed an eigenvalue of greater than one for four items, thereby providing insight that four factors could be generated from the 16 items (Figure 1).

The Kaiser-Meyer-Olkin value was 0.90 with a p -value < 0.001 , indicating that the sample was large enough to perform factor analysis and that the sample size was adequate for the psychometric testing of a 16-item questionnaire.

Factor loading of the 16-item scale was separated into a four-factor component and provided a good fit demarcating the four constructs (Table 2). Based on factor loadings, four items formed Purchase Involvement. An item originally deemed to reflect Awareness of Care Needed during Self-Medication was re-positioned to Purchase Involvement and it eventually replaced an item from that domain because of the similarity in wording. As such, four items fit into Purchase Involvement and the Self-Efficacy constructs, three items fit into Awareness of Care Needed during Self-Medication and the last four items fit into the Therapeutic Usefulness of OTC Medicines constructs. The 16-item scale was finally reduced to a 15-item scale based on the principal factor analysis. Hence, the PSM-OTC scale comprises 15 items.

Table 3 shows the descriptive analysis and the reliability studies of the four components within the PSM-OTC scale. All the constructs showed a suitable mean and Cronbach's alpha.

Test-retest procedure

Twenty subjects were systematically selected from 200 completed documents to examine consistency in responses from T1 to T2. Over 50 percent of respondents had no change in their responses for 9 out of the original 16 items. Three out of the four items for the Purchase Involvement construct had three or more-unit changes in 5 percent of the sample. All four items of the Self-Efficacy construct had two or less unit changes. Only one of the four items of the Awareness of Care Needed

during Self-Medication measure had three or more changes in 5 percent of the sample, and just one out of the four items for Therapeutic Usefulness of OTC Medicines had three or more changes in five to 10 percent of the sample (Table 3).

Test-retest reliability coefficients for each item in the four constructs ranged from $r = 0.4$ to 0.5 and from 0.5 to 0.7 for ICCs. A paired sample t-test was conducted to assess any difference between the rating for each of the constructs at T1 and T2 (Table 4). There was no statistically significant difference in the rating at the two iterations for each of the constructs, suggesting good internal consistency.

Discussion

This study described the development of the Propensity to Self-Medicate with OTC Medicines scale with assessment including validity and reliability of the instrument. The 15-item scale was comprised of four components: Purchase Involvement, Self-Efficacy, Awareness of Care Needed during Self-Medication, and the Therapeutic Usefulness of OTC Medicines. This concept is novel in the field of OTC medicine research to the best of our knowledge. With 15 items and scale lengths of 7-points, the range of possible scores for the scale would be a high of 105 to a low of 15.

A recent study on the propensity to self-medicate by Rajamma et al. used three item-wordings to measure propensity, with a Cronbach alpha ranging from 0.6 to 0.8 .²⁹ Four constructs – chance health locus of control, individual health locus of control, powerful others health locus of control and self-efficacy were correlated with the propensity measure. Rajamma showed that consumer propensity to self-medicate increases with increased self-efficacy, a belief that health-related well-being is a matter of luck and individual perception of control over their health-related well-being. Perception of health control by other people (such as health professionals) did not increase any propensity to self-medicate. This finding shows some similarities to the components of the PSM-OTC.

Construct development followed an iterative process of multiple procedures and principles described in the literature for the creation of similar tools.⁴⁹⁻⁵¹ The expert review provided a fair measure of the internal validity through qualitative and quantitative feedback. McHugh described an inter-rater agreement of 80 percent and above as excellent, with scores between 60 and 80 percent as good.⁵³ Therefore, strong inter-rater agreement was garnered for three out of the four components, while the fourth (which had 67 percent agreement) was modified for improvement. The overall percent agreement was 87.6 percent.

Another widely used measure of reliability is the test-retest procedure. The determinations of the degrees of change in the four constructs was consistent with previous reports for other constructs.^{42,44-46,52-55} Hence, the estimate reveals an acceptable degree of reliability in responses.

Based on the internal consistency and reliability measurements for Cronbach's alpha and the test-retest procedure, the PSM-OTC scale may have utility in reflecting consumer propensity to self-medicate.

Limitations

The limitations of this study are ones inherently seen in survey research – the distilling of complex human behavior into numerical constructs. The decision by any person to use an OTC medicine for an ailment will be predicated on a host of internal and external factors, some known and likely some unknown.

A limitation is that some items for the Awareness of Care Needed during Self-Medication and the Therapeutic Usefulness of OTC Medicines components were newly created, unlike the other two components (Purchase Involvement and Self-Efficacy) that were adapted from previously used scales.

There is a possibility of response bias among respondents during all facets of data recovery. Sampling error could be in place that would lead to responses that do not reflect the population under study, given that the sample used was one created by the survey department using volunteers. Although a random sampling technique was used to generate the data, the generalizability of the findings may be limited by the skewness of the data towards the female gender and older population, in contrast to the typical demographic of Saskatchewan. Nevertheless, the large sample size provides some reassurance in the data gathered and the validity and reliability of the construct provide some promise for the PSM-OTC scale.

Conclusion

A tool to measure the propensity to self-medicate with OTC medicines has been developed. The instrument revealed an acceptable level of internal consistency and reliability. The scale may have research potential in assessing the propensity of different cohorts of society to self-medicate.

The opinions expressed in this paper are those of the authors.

Author contribution statement:

Ayosanmi O.S. designed the study as part of his PhD project, wrote the initial draft of the manuscript, did all statistical analysis and made all necessary corrections to the manuscript. Delbaere M. reviewed the manuscript for conceptual validity and contributed to the refining of the article.

Taylor J. conceptualized, designed and supervised the study as the PhD supervisor of Ayosanmi O.S. and edited the manuscript drafts until the final document.

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Data availability statement: Research data is stored and retained in sole possession of the University of Saskatchewan. Any access to the data could only be made by obtaining permission from the University.

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Table 1: Inter-rater Agreement during Expert Review of the 16-item Scale

	Item Wording	Rater 1	Rater 2	Rater 3	Percent
1	I take a long time to decide which OTC medicine to buy.	Y ^a	Y	Y	100
2	I get as much information as possible before buying an OTC medicine.	Y	Y	Y	100
3	I am interested in reading information about how OTC medicines work.	Y	Y	Y	100
4	I compare product characteristics among brands of OTC medicines.	Y	Y	Y	100
5	I feel confident in making decisions about my health.	Y	Y	Y	100
6	I know how to adapt general health information to my own situation.	Y	Y	Y	100
7	Taking an active role in my own health care is important to me.	Y	Y	Y	100
8	I am confident I can tell when I need medical care, as well as when I can handle a health problem myself.	Y	Y	Y	100
9	I generally read package information (<i>beyond simply what amount to use</i>) when using an OTC medicine for the first time.	Y ^a	Y	Y	100
10	There are risks with OTC medicines, even when you follow the directions on the package.	Y ^a	Y	Y	100
11	Some OTC medicines can interact with other medicines or herbal products.	N	Y	Y	67
12	People with chronic health problems need to consider the use of OTC medicines carefully.	N	Y	Y	67
13	OTC medicines are generally stress-free to take (or use).	N	Y	Y	67
14	Getting good results with an OTC medicine for a health problem could lead me to try others for different problems.	N	Y	Y	67
15	When situations are not serious enough to see a doctor, trying an OTC medicine makes sense.	N	Y	Y	67
16	Medicines not needing a doctor's prescription are an important option for the public to have.	N	Y	Y	67
Aggregate interrater agreement					87.6

^aInitial votes were *maybe* but they were counted as yes after consultation with the expert

Table 2: Principal Components Analysis of the Propensity to Self-Medicate with OTC Medicines Scale

	Item Wording	Factor Loading Components			
		1	2	3	4
	<i>Purchase Involvement</i>				
1	I take my time to decide which OTC medicine to buy when purchasing it for the first time.	0.74			
2	I get as much information as possible before buying an OTC medicine.	0.77			
3	I generally read package information (beyond simply what amount to use) when using an OTC medicine for the first time.	0.69			
4	I compare product characteristics among brands of OTC medicines before buying any.	0.72			
	<i>Self-Efficacy</i>				
5	I feel confident in making decisions about my health.		0.80		
6	I know how to adapt general health information to my own situation.		0.72		
7	Taking an active role in my own health care is important to me.		0.48		
8	I am confident I can tell when I need medical care, as well as when I can handle a health problem myself.		0.81		
	<i>Awareness of Care during Self-Medication</i>				
9	There are some risks with OTC medicines, even when you follow the directions on the package.				0.74
10	Some OTC medicines can interact with other medicines or herbal products.				0.75
11	People with chronic health problems need to consider the use of OTC medicines carefully.				0.72
	<i>Therapeutic Usefulness of OTC Medications</i>				
12	OTC medicines are generally stress-free to take (or use).			0.59	
13	Getting good results with an OTC medicine for a health problem could lead me to try others for different problems.			0.66	
14	When situations are not serious enough to see a doctor, trying an OTC medicine makes sense.			0.79	
15	Medicines not needing a doctor's prescription are an important option for the public to have.			0.78	

Table 3: Degree of Change in 1st to 2nd Responses for the PSM-OTC Scale

Item Wording / Constructs	Total Subjects with no change	Total Subjects with 1 unit change	Total Subjects with 2 units change	Total Subjects with 3-4 units change	Total Subjects with 5-6 units change
Purchase Involvement					
1. I take my time to decide which OTC medicine to buy when purchasing it for the first time.	9 (45%)	10 (50%)	1 (5%)	0	0
2. I get as much information as possible before buying an OTC medicine.	6 (30%)	8 (40%)	4 (20%)	1 (5%)	1 (5%)
3. I compare product characteristics among brands of OTC medicines before buying any.	8 (40%)	8 (40%)	2 (10%)	2 (10%)	0
4. I generally read package information (beyond simply what amount to use) when using an OTC medicine for the first time.	11 (55%)	8 (40%)	0	1 (5%)	0
Self-Efficacy					
5. I feel confident in making decisions about my health.	10 (50%)	9 (45%)	1 (5%)	0	0
6. I know how to adapt general health information to my own situation.	9 (45%)	11 (55%)	0	0	0
7. Taking an active role in my own health care is important to me.	13 (65%)	7 (35%)	0	0	0
8. I am confident I can tell when I need medical care, as well as when I can handle a health problem myself.	11 (55%)	7 (35%)	2 (10%)	0	0
Awareness of Care Needed during Self-Medication					
9. There are some risks with OTC medicines, even when you follow the directions on the package.	9 (45%)	8 (40%)	3 (15%)	0	0
10. Some OTC medicines can interact with other medicines or herbal products.	12 (60%)	8 (40%)	0	0	0
11. People with chronic health problems need to consider the use of OTC medicines carefully.	11 (55%)	9 (45%)	0	0	0

Therapeutic Usefulness of OTC Medications					
12. OTC medicines are generally stress-free to take (or use).	5 (25%)	9 (45%)	3 (15%)	2 (10%)	1 (5%)
13. Getting good results with an OTC medicine for a health problem could lead me to try others for different problems.	10 (50%)	9 (45%)	1 (5%)	0	0
14. When situations are not serious enough to see a doctor, trying an OTC medicine makes sense.	13 (65%)	7 (35%)	0	0	0
15. Medicines not needing a doctor's prescription are an important option for the public to have.	11 (55%)	8 (40%)	1 (5%)	0	0

Table 4: Paired Sample t-test measuring differences in ratings at Time 1 and Time 2

		Paired Differences				t	df	Sig
		Mean difference (T1 – T2)	SD	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1	Purchase Involvement	0.4	4.3	-0.2	1.01	1.4	210	0.16
Pair 2	Awareness of Care Needed	0.1	2.9	-0.3	0.48	0.4	210	0.71
Pair 3	Self-efficacy	-0.5	3.8	-0.9	0.06	-1.7	210	0.09
Pair 4	Perceived Usefulness	-0.5	3.6	-0.9	0.04	-1.8	209	0.08

SD = standard deviation; t = t-test; df = degree of freedom; Sig = significant; p = p value