

ORIGINAL ARTICLE

Questionnaire for Assessing Knowledge and Self-Reported Antipsychotic Dispensing Practices Among Indonesian Pharmacists: A Rasch Analysis of Validity Evidence

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ABSTRACT

Inappropriate dispensing of antipsychotic medications may cause preventable medication-related harm, yet validated instruments for assessing pharmacists' knowledge and dispensing practices remain limited in Indonesia. This study evaluated the Rasch measurement properties of a questionnaire developed for Indonesian pharmacists. A cross-sectional survey was conducted among 642 pharmacists recruited through convenience sampling using professional pharmacy networks and online communication platforms. Participants completed a 22-item instrument comprising 12 dichotomous knowledge items and 10 five-category practice items. 22-item instrument comprising 12 dichotomous knowledge items and 10 five-category self-reported practice items. The two domains were analysed separately using the Rasch model, assessing person and item fit, unidimensionality based on principal component analysis of standardized residuals (with a first-contrast eigenvalue <2.0), reliability, separation, item-person targeting, and sex-related differential item functioning. Item fit was evaluated using Infit and Outfit mean-square (MNSQ) statistics, with values between 0.5 and 1.5 considered acceptable. Mean person and item infit and outfit mean-square values were close to 1.00 in both domains. Person reliability was 0.78 for knowledge and 0.86 for practice, item reliability was 1.00 in both domains, and Cronbach's alpha values were 0.76 and 0.87, respectively. The Rasch measures explained 60.5% of the variance in knowledge and 69.5% in practice. Wright maps showed satisfactory central targeting, and no visually apparent moderate-to-large sex-related differential item functioning was identified. Overall, the instrument demonstrated satisfactory initial Rasch-based validity and reliability, although further validation in geographically balanced samples and comparison with observed dispensing behaviour are warranted.

Keywords: antipsychotic medications; dispensing practices; pharmacists; Rasch analysis

Introduction

Inappropriate dispensing of antipsychotic medications is an important medication-safety concern because these medicines require appropriate clinical assessment, prescription control, and professional oversight [1]. A study conducted in Nigeria reported that 71.4% of community pharmacists had dispensed antipsychotics without a valid prescription, despite 87.4% demonstrating good knowledge of antipsychotic classifications and adverse effects. These findings highlight that adequate knowledge does not necessarily translate into compliant dispensing practices. In the Indonesian context, this observation is particularly relevant because antipsychotic medications are classified as prescription-only medicines and should only be dispensed upon presentation of a valid prescription [2]. The discrepancy between knowledge and practice underscores the importance of strengthening regulatory compliance, professional accountability, and continuing education initiatives to promote appropriate dispensing

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practices and safeguard patient safety in community pharmacy settings [3]. Such practices may expose patients to inappropriate medicine selection, treatment interruption, adverse effects, drug interactions, and delayed clinical assessment. These risks are particularly important because antipsychotics are associated with neurological, metabolic, cardiovascular, endocrine, and sedative adverse effects that require careful clinical management [4]. In Indonesia, evidence concerning pharmacists' knowledge and dispensing practices related specifically to antipsychotic medications remains limited [5]. A psychometrically robust instrument is therefore needed to assess these constructs and identify aspects of knowledge and dispensing practice that may require educational or professional attention.

Previous studies have assessed medication-related knowledge and professional practice among various populations, including community pharmacists [6], healthcare professionals [7], pharmacy students [8,9], and medication users [10]. The measured constructs have primarily included medication knowledge, dispensing behaviour, regulatory compliance, and professional practice, typically using self-administered questionnaires or researcher-developed survey instruments. Validation approaches have generally involved content validity assessment, exploratory or confirmatory factor analysis, and internal consistency testing. However, few studies have developed and comprehensively validated instruments specifically designed to assess pharmacists' knowledge and dispensing practices related to antipsychotic medications using Rasch measurement analysis. Therefore, the present study contributes to the literature by providing a psychometrically robust instrument that evaluates both knowledge and practice domains while examining item functioning, targeting, reliability, and differential item functioning [11]. One study developed the Antipsychotic Medication Management Fidelity Scale to assess organisational policies and prescriber practices within Norwegian mental-health services rather than pharmacists' individual knowledge and dispensing practices [7]. A previous study evaluated pharmacists' knowledge, attitudes, and practices regarding psychotropic medicines in Riyadh; however, the study was conducted in a single city, examined

psychotropic medicines broadly, and used conventional scoring without item-level Rasch evaluation [6]. In Indonesia, the PATARAS study evaluated pharmacy students' perceptions and attitudes towards antimicrobial resistance and antimicrobial stewardship using confirmatory factor analysis and structural equation modelling [9], whereas the AKAQ study used Rasch analysis to assess pharmacy students' antibiotic knowledge [8]. The KATUB-Q study also applied Rasch analysis, but it assessed tuberculosis knowledge in the Indonesian general population rather than pharmacists' medication-related practices [10]. To the best of our knowledge, no Indonesia-wide study has applied Rasch measurement analysis to an instrument assessing practising pharmacists' antipsychotic-specific knowledge and self-reported dispensing practices. The present study addresses this gap by evaluating the measurement properties, item hierarchy, reliability, targeting, and sex-related differential item functioning of the knowledge and practice domains. Sex-related DIF was specifically examined to determine whether items functioned equivalently across male and female pharmacists with comparable levels of the underlying construct. This analysis was included to assess measurement invariance, identify potential item bias, and ensure that score differences reflected true differences in knowledge and practice rather than systematic differences related to sex.

This study aimed to evaluate the psychometric performance of an instrument assessing Indonesian pharmacists' antipsychotic-related knowledge and self-reported dispensing practices using Rasch measurement analysis. Specifically, the study examined person and item fit, unidimensionality, reliability and separation, item difficulty, respondent measures, item-person targeting, and differential item functioning by sex. The findings are expected to support instrument refinement, identification of educational needs, development of continuing professional education programmes, and medication-safety initiatives related to antipsychotic dispensing in pharmacy practice.

METHODS

Study Design, Participants, and Setting

A cross-sectional survey was conducted among pharmacists between December 2025 and May 2026 using convenience sampling. The study aimed to evaluate the psychometric properties and measurement performance of an instrument assessing pharmacists' knowledge and self-reported dispensing practices related to antipsychotic medications. Data were collected using a self-administered online questionnaire developed in Google Forms. Although participants were recruited from multiple regions of Indonesia, 95.5% of respondents were from the Western Indonesia Time (WIB) region. Consequently, the sample should not be considered nationally representative, and the findings may not fully reflect the characteristics of pharmacists practicing in the Central Indonesia Time (WITA) and Eastern Indonesia Time (WIT) regions. This limitation should be considered when interpreting the generalizability of the study findings. The questionnaire was distributed through WhatsApp, email, and social media channels associated with professional pharmacy networks, including the Indonesian Pharmacists Association and the Indonesian Psychiatric Pharmacists Association, using convenience sampling. This recruitment approach may have introduced selection bias because pharmacists who were more actively engaged with professional organizations, social media, or digital communication platforms may have been more likely to participate. Consequently, the sample may not fully represent pharmacists who were less connected to these networks, which may limit the generalizability of the findings. Recruitment targeted pharmacists across Indonesia's 38 provinces.

Sample Size and Recruitment

The target population comprised approximately 172,305 pharmacists registered in Indonesia in 2024. An initial recruitment target was estimated using the Raosoft Sample Size Calculator, which yielded a minimum of 384 participants. However, because the primary objective of the study was instrument validation using Rasch measurement, sample adequacy was evaluated based on Rasch analysis requirements, including stable item calibration and reliable estimation of person and item parameters across the response categories. The final sample of 642 pharmacists exceeded

commonly recommended sample sizes for Rasch validation studies and was therefore considered sufficient for robust evaluation of item fit, reliability, separation, targeting, unidimensionality, and differential item functioning. To improve the precision and stability of Rasch psychometric estimates, ensure adequate representation across participant subgroups, and account for potential non-response, incomplete questionnaires, and exclusion of ineligible responses, the recruitment target was increased by 50% to 576 pharmacists. All eligible and complete responses received during the data-collection period were included, resulting in a final analytical sample of 642 pharmacists.

Participants were eligible if they were registered pharmacists working in community pharmacies, hospitals, primary healthcare centres, clinics, or health offices; were affiliated with a professional pharmacy organisation, which served as a practical recruitment channel for identifying and reaching licensed practicing pharmacists through established professional networks; had internet access; and provided electronic informed consent. However, this criterion may have introduced selection bias, as pharmacists who were not affiliated with or actively engaged in professional organizations may possess different demographic, professional, or practice characteristics. Consequently, the findings should be interpreted with caution, and their generalizability to all pharmacists in Indonesia may be limited. Pharmacists employed in the pharmaceutical industry or pharmaceutical wholesalers were excluded because their professional responsibilities did not routinely involve direct dispensing of antipsychotic medications. Incomplete questionnaire responses were also excluded.

Instrument Development

The questionnaire was developed through four stages: conceptual framework development, item generation, expert-based item screening and content validation, and pilot testing.

Conceptual Framework Development

The conceptual framework was informed by previous studies conducted in Nigeria and Vietnam and by the Indonesian Ministry of Health guideline on

pharmaceutical care for patients with mental disorders. Relevant concepts and items from existing instruments were adapted and expanded to reflect pharmacists' knowledge and routine dispensing decisions concerning antipsychotic medications within the Indonesian healthcare context.

Item Generation

The questionnaire comprised two sections. The first section collected demographic and professional information, including age, sex, educational level, marital status, monthly income, geographic region, and whether the respondent's pharmacy accepted antipsychotic prescriptions. The second section assessed pharmacists' knowledge and self-reported dispensing practices related to antipsychotic medications.

The knowledge domain comprised 12 dichotomous items covering the regulatory status, pharmacological classification, clinical use, adverse effects, prescription requirements, and appropriate

dispensing of antipsychotic medications. Correct responses were assigned a score of 1, whereas incorrect responses were assigned a score of 0.

The practice domain comprised 10 statements describing dispensing decisions in commonly encountered practice scenarios. Responses were recorded using a five-category Likert scale ranging from Strongly disagree to Strongly agree. For the practice domain, responses were coded according to the appropriateness of the reported dispensing behaviour. Items describing potentially inappropriate dispensing practices were reverse-coded so that, across all items, higher category scores consistently represented more appropriate practice. This coding direction was maintained for the subsequent Rasch analysis and interpretation of item and person measures. The final instrument comprised 22 items: 12 knowledge items and 10 practice items, as presented in **Appendices 1 and 2**, respectively.

Appendix 1. The complete knowledge-domain questionnaire

Item	Description	Answer	
		Yes	No
K1	Antipsychotic medications can be sold as over-the-counter (OTC) medicines		√
K2	The use of antipsychotic medications should be discontinued once the patient no longer exhibits signs and symptoms		√
K3	Atypical antipsychotics are more frequently associated with neurological adverse effects than typical antipsychotics		√
K4	Patients with diabetes mellitus are safer when treated with atypical antipsychotics than with typical antipsychotics		√
K5	One of the major adverse effects of conventional antipsychotic medications is extrapyramidal symptoms	√	
K6	Atypical antipsychotics are a classic example of the butyrophenone class, such as haloperidol		√
K7	As a community pharmacist, antipsychotic therapy is best provided to patients with recurrent signs or symptoms		√
K8	Patients should preferably be prescribed only one class of antipsychotic medication to improve treatment adherence	√	
K9	Patients who have never received antipsychotic treatment should preferably be started on atypical rather than typical antipsychotics	√	
K10	Antipsychotic medications from different classes should be prescribed to patients who have experienced psychotic symptoms for more than one year		√
K11	Antipsychotic medications must be dispensed only with a prescription	√	
K12	Antipsychotic medications cannot be dispensed using a copy of a prescription	√	

Appendix 2. The complete practice-domain questionnaire

Item	Description	Answer				
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
P1	I sometimes dispense antipsychotic medications as over-the-counter (OTC) medicines, particularly in emergency situations. For example, when a familiar patient has run out of their medication and urgently needs it					
P2	As a pharmacist, I do not request a prescription for antipsychotic medications when dispensing them to patients I know					
P3	If a patient comes to the pharmacy to purchase an antipsychotic medication, I will dispense it because I believe they know how to use it appropriately					
P4	I dispense typical antipsychotics (e.g., chlorpromazine and haloperidol) as over-the-counter (OTC) medicines, but I require a prescription for atypical antipsychotics					
P5	I am willing to dispense antipsychotic medications to older adults because I believe they are mature enough to know what they want to purchase					
P6	I am willing to dispense antipsychotic medications to parents who come to the pharmacy to purchase them for their children					
P7	I am willing to dispense antipsychotic medications when patients report having had a positive experience with the brand they previously used					
P8	I am willing to dispense antipsychotic medications to patients when they tell me they have been taking them for a long time					
P9	I may switch a patient to another class of antipsychotic medication when they complain about the medication they are currently taking					
P10	I prefer prescribing chlorpromazine rather than clonazepam to obese patients because it causes weight gain					

All these questions are recorded in Hak Kekayaan Intelektual (HKI) No. EC002026117116

Item Screening and Content Validity

Five experts, comprising two psychiatrists, one psychiatric nurse, and two clinical pharmacists, were purposively selected based on their professional qualifications and expertise in psychiatric care, psychotropic medication management, and clinical pharmacy practice. All experts had substantial experience in their respective fields and independently evaluated the relevance, clarity, comprehensibility, and content coverage of each questionnaire item. Content validity was assessed using the Content Validity Index (CVI), whereby each expert rated item relevance on a four-point scale. The Item-Level Content Validity Index (I-CVI) was calculated as the proportion of experts rating

an item as relevant, while the Scale-Level Content Validity Index (S-CVI) was used to evaluate the overall content validity of the questionnaire. Content validity was assessed using the content validity index. The item-level content validity index was calculated to determine expert agreement regarding the relevance of individual items, whereas scale-level content validity was evaluated using both the universal-agreement method and the average method.

The prespecified acceptability thresholds were an item-level content validity index of at least 0.78, a scale-level content validity index based on universal agreement of at least 0.80, and a scale-level content validity index based on the average method of at least

0.90 [12]. Items that did not meet these thresholds or were considered unclear, ambiguous, or insufficiently representative by the experts were revised or removed before pilot testing.

Pilot Testing

The preliminary questionnaire was pilot-tested among 30 community pharmacists who were not included in the main study. The pilot test assessed the readability, comprehensibility, clarity, and appropriateness of the questionnaire items and response options. Participants were also invited to identify ambiguous terminology and items that were difficult to interpret. The questionnaire was subsequently refined based on their feedback before administration in the main study.

Construct Validation Using Rasch Analysis

Rasch measurement analysis was performed to evaluate the construct validity, reliability, and measurement performance of the knowledge and practice domains. These models were selected because they provide invariant estimates of item difficulty and respondent ability on a common logit scale and allow comprehensive evaluation of item fit, reliability, separation, targeting, and measurement validity. Rasch analysis transformed the observed responses into logit measures that located respondents and items on a common latent continuum. Within the knowledge domain, person measures reflected respondents' underlying level of antipsychotic knowledge, whereas item measures represented the relative difficulty of answering each item correctly. Within the practice domain, person measures represented respondents' propensity to endorse the practice statements according to the applied coding scheme, whereas item measures reflected the relative difficulty of endorsing each statement. The measurement performance of both domains was evaluated using person- and item-fit statistics, unidimensionality, person and item reliability and separation, item-person targeting, and differential item functioning.

Statistical Analysis

Data collected through Google Forms were exported to Microsoft Excel for checking, cleaning, and

coding. Descriptive analyses were conducted using IBM SPSS Statistics version 29.0. Categorical participant characteristics were summarised using frequencies and percentages. Continuous variables, when applicable, were summarised using means and standard deviations for approximately normally distributed data or medians and interquartile ranges for non-normally distributed data.

Rasch analyses were conducted separately for the knowledge and practice domains using Winsteps version 5.2.1.0. Measurement performance was evaluated using infit and outfit mean-square statistics, standardised fit statistics, point-measure correlations, principal component analysis of Rasch residuals, person and item reliability and separation, Wright maps, and sex-related differential item functioning.

Item and Person Fit

Person and item fit were evaluated using infit and outfit mean-square statistics. Mean-square values between 0.50 and 1.50 were considered productive for measurement. Values below 0.50 indicated responses that were more predictable than expected by the Rasch model, whereas values above 1.50 indicated excessive unexplained variation [13]. Standardised fit statistics were examined as supplementary indicators but were interpreted cautiously because of their sensitivity to large sample sizes.

Point-measure correlations were also evaluated and were expected to be positive. Positive correlations indicated that the items functioned in the intended direction and contributed consistently to the corresponding latent construct.

Structural Validity

The unidimensionality of each domain was assessed using principal component analysis of Rasch residuals. A raw variance explained by the Rasch measure greater than 30% was considered evidence of a dominant underlying construct. An eigenvalue below 3.0 for the first unexplained residual contrast was used as an additional criterion supporting unidimensionality [14].

Reliability and Separation

Person and item reliability values greater than 0.70

were considered acceptable. Person reliability reflected the reproducibility of respondents' ordering along the measured construct, whereas item reliability represented the stability of the item-difficulty hierarchy [15]. Person separation indicated the instrument's ability to distinguish respondents with different levels of knowledge or practice, while item separation indicated whether the sample was sufficiently large and heterogeneous to establish a stable hierarchy of item difficulty. A separation index of approximately 2.0 or higher was considered desirable. Cronbach's alpha was additionally calculated to evaluate the internal consistency of each domain [16].

Item-Person Targeting

Wright maps were generated to display person measures and item difficulties on the same logit scale. The maps were examined to determine whether the range and distribution of item difficulties adequately covered the distribution of respondent measures. The easiest and most difficult items were identified according to their positions on the latent continuum. The correspondence between mean person and item locations and the presence of gaps at the upper or lower ends of the continuum were also examined to evaluate overall targeting.

Differential Item Functioning

Differential item functioning was examined to determine whether individual items functioned differently for male and female respondents with comparable underlying levels of knowledge or practice. DIF analyses were conducted separately for the knowledge and practice domains. An absolute DIF contrast of at least 0.64 logits was interpreted as moderate-to-large and potentially meaningful DIF. DIF plots were also visually inspected to assess the alignment of item-difficulty estimates between male and female respondents.

Ethical Considerations

The study was approved by Ethic Committee Universitas Harapan Bangsa under approval number (B.LPPM-UHB/679/05/2026). Before accessing the questionnaire, prospective participants received information regarding the study objectives, voluntary

participation, confidentiality, and their right to withdraw without consequences. Electronic informed consent was obtained before questionnaire completion. No directly identifying information was collected.

RESULT AND DISCUSSION

Face and content validity were assessed by a panel of five experts. The experts evaluated each item for relevance, clarity, comprehensibility, and representativeness of the intended construct. All 12 knowledge items achieved item-level content validity index (I-CVI) values ranging from 0.80 to 1.00, with an S-CVI/Ave of 0.983 and an S-CVI/UA of 0.917. Similarly, all 10 practice items obtained I-CVI values ranging from 0.80 to 1.00, with an S-CVI/Ave of 0.980 and an S-CVI/UA of 0.900. These findings indicate excellent content validity for both domains, and all 22 items met the prespecified acceptability criterion and were retained for subsequent pilot testing and Rasch analysis. Detailed CVI results for the knowledge and practice domains are presented in **Appendices 3 and 4**, respectively.

The analysis included 642 participants. Most were female (78.5%), were 31-40 years old (33.3%), held a bachelor's degree (80.4%), and were married (70.6%). Monthly salary was almost evenly distributed between IDR 2,500,000-5,000,000 (45.2%) and more than IDR 5,000,000 (45.0%). For pharmacy acceptance of antipsychotic prescriptions, 239 participants (37.2%) responded "yes," whereas 403 (62.8%) responded "no." Most participants were located in the Western Indonesian Time region (WIB; 96.0%), with 2.0% each from the Central Indonesian Time (WITA) and Eastern Indonesian Time (WIT) regions (**Table 1**).

The sample of 642 pharmacists provided sufficient information to estimate item difficulties and respondent locations with high precision. Nevertheless, 95.95% of participants were from the Western Indonesian Time (WIB) region, and female respondents substantially outnumbered male respondents. This geographic concentration may limit the external validity and national generalizability of the instrument, as pharmacists from the Central Indonesian Time (WITA) and Eastern Indonesian Time (WIT) regions were

Appendix 3. The full CVI assessment of the knowledge domain.

Item	Panelist 1		Panelist 2		Panelist 3		Panelist 4		Panelist 5		Number of Agreements	I-CVI
	n	code	n	code	n	code	n	code	n	code		
K1	4	R	3	R	4	R	4	R	3	R	5	1
K2	3	R	4	R	3	R	3	R	4	R	5	1
K3	4	R	4	R	3	R	4	R	3	R	5	1
K4	3	R	3	R	2	NR	4	R	3	R	4	0.8
K5	4	R	4	R	4	R	3	R	4	R	5	1
K6	3	R	3	R	3	R	3	R	3	R	5	1
K7	4	R	4	R	4	R	4	R	3	R	5	1
K8	3	R	4	R	3	R	3	R	4	R	5	1
K9	4	R	3	R	4	R	3	R	4	R	5	1
K10	3	R	4	R	4	R	3	R	3	R	5	1
K11	4	R	3	R	3	R	4	R	3	R	5	1
K12	3	R	4	R	3	R	4	R	3	R	5	1
											Mean	0.983
											S-CVI/UA	0.917

Appendix 4. The full CVI assessment of the practice domain.

Item	Panelist 1		Panelist 2		Panelist 3		Panelist 4		Panelist 5		Number of Agreements	I-CVI
	n	code	n	code	n	code	n	code	n	code		
P1	4	R	3	R	4	R	3	R	2	NR	4	0.8
P2	3	R	3	R	3	R	3	R	3	R	5	1
P3	4	R	4	R	3	R	4	R	3	R	5	1
P4	3	R	3	R	4	R	3	R	4	R	5	1
P5	4	R	3	R	4	R	3	R	4	R	5	1
P6	3	R	4	R	3	R	4	R	3	R	5	1
P7	4	R	4	R	4	R	4	R	3	R	5	1
P8	3	R	3	R	3	R	3	R	4	R	5	1
P9	4	R	3	R	4	R	3	R	4	R	5	1
P10	3	R	4	R	3	R	3	R	4	R	5	1
											Mean	0.98
											S-CVI/UA	0.9

underrepresented. Consequently, although the instrument demonstrated satisfactory psychometric properties in the present sample, further validation studies involving more geographically diverse pharmacist populations are warranted to confirm its applicability across different regions of Indonesia. Although Rasch calibration is intended to produce relatively sample-independent item estimates when

model assumptions are satisfied, the marked geographic imbalance limits the generalisability of the findings [16]. The resulting item hierarchy may primarily reflect the educational, regulatory, and professional contexts experienced by pharmacists in western Indonesia. Replication in more balanced samples from the Central and Eastern Indonesian Time regions is therefore required.

Table 1. Demographics of participants (n = 642)

Baseline characteristics	n	%
Sex		
Female	504	78.50%
Male	138	21.50%
Age		
23-30 years	151	23.52%
31-40 years	214	33.33%
41-50 years	189	29.44%
51-60 years	75	11.68%
>60 years	13	2.02%
Educational Level		
Bachelor's degree	516	80.37%
Master's degree	113	17.60%
Doctoral degree	13	2.02%
Marital		
Single	151	23.52%
Married	453	70.56%
Divorced	25	3.89%
Widowed	13	2.02%
Salary		
< 2,500,000	63	9.81%
2,500,000-5,000,000	290	45.17%
>5,000,000	289	45.02%
Pharmacy Acceptance of Antipsychotic Prescriptions		
Yes	239	37.23%
No	403	62.77%
Region		
WIB	616	95.95%
WITA	13	2.02%
WIT	13	2.02%

This study provides initial evidence supporting the Rasch measurement properties of a 22-item instrument designed to assess Indonesian pharmacists' knowledge and self-reported dispensing practices concerning antipsychotic medications. The 12-item knowledge domain and 10-item practice domain demonstrated acceptable item fit, positive point-measure correlations, adequate internal consistency, dominant underlying constructs, satisfactory central item-person targeting, and no visually apparent moderate-to-large differential item functioning by sex.

However, the knowledge domain exhibited a person separation value of 1.88, indicating a modest rather than strong ability to distinguish between different levels of respondent knowledge. Accordingly, the findings support acceptable measurement performance, although further refinement may improve the discriminative capacity of the knowledge domain. The practice domain showed stronger person reliability and separation than the knowledge domain, indicating greater discrimination among respondents with different levels of self-reported practice.

The mean person infit and outfit mean-square (MNSQ) values were 0.98 and 0.81, respectively, for the knowledge domain and 0.99 and 1.00 for the practice domain. The corresponding mean item infit and outfit MNSQ values were 0.99 and 0.97 for knowledge and 0.99 and 1.00 for practice. Mean standardized fit statistics were close to zero for both persons and items in both domains.

Person reliability was 0.78 for knowledge and 0.86 for practice, whereas item reliability was 1.00 in both domains. Cronbach's alpha was 0.76 for knowledge and 0.87 for practice. Person separation coefficients were 1.88 and 2.44, and item separation coefficients were 20.75 and 18.68, for the knowledge and practice domains, respectively. The variance explained by the Rasch measures was 60.5% for knowledge and 69.5% for practice; unexplained variance in the first contrast was 5.3% and 3.7%, respectively (Table 2).

The mean person and item infit and outfit mean-square values were close to the Rasch-expected value of 1.00 in both domains, indicating that the observed responses were generally consistent with model expectations. The knowledge-domain person outfit value of 0.81 suggested slightly more predictable response patterns than expected but remained within the acceptable range [17]. The dimensionality findings also supported the structural validity of the instrument. The Rasch measures explained 60.5% of the variance in knowledge and 69.5% in practice. Furthermore, the unexplained variance in the first residual contrast was 3.7% for the knowledge domain and 5.3% for the practice domain. These relatively small residual contrasts suggest that no substantial secondary dimension was present, providing additional support for the

Table 2. Summary statistics of Rasch parameters for Antipsychotic (n=642)

Criteria	Knowledge		Practice	
	Person	Item (Question)	Person	Item (Question)
N		12		10
Mean				
Infit MNSQ	0.98	0.99	0.99	0.99
Infit ZSTD	-0.1	-0.1	0	-0.3
Outfit MNSQ	0.81	0.97	1	1
Outfit ZSTD	0	-0.1	0	0
Reliability (Rasch)	0.78	1	0.86	1
Reliability (Cronbach's alpha)	0.76		0.87	
Separation coefficient	1.88	20.75	2.44	18.68
Unidimensionality				
Raw variance by measure	60.50%		69.50%	
Unexplained variance in 1st contrast	5.30%		3.70%	

unidimensionality and structural validity of both domains. The higher explained variance and lower unexplained variance in the first contrast for practice suggested greater internal coherence in that domain [18]. In contrast, the knowledge domain covered diverse content, including regulation, pharmacological classification, adverse effects, clinical use, treatment continuation, and dispensing requirements. This heterogeneity may explain the slightly greater residual variance [19]. Future validation should report the eigenvalue and item loadings of the first residual contrast and assess residual correlations to determine whether weaker secondary dimensions or local item dependence are present.

Reliability was acceptable for both domains, although the practice domain performed more strongly. Person reliability was 0.78 for knowledge and 0.86 for practice, while Cronbach's alpha values were 0.76 and 0.87, respectively. Person separation was 1.88 for knowledge and 2.44 for practice, indicating that the knowledge domain distinguished respondents across

relatively broad ability levels but offered less precise differentiation than the practice domain [20]. Additional knowledge items targeted at underrepresented difficulty levels may improve respondent classification. By contrast, item reliability was 1.00 in both domains, with high item-separation coefficients, indicating a stable and precisely estimated item-difficulty hierarchy. These values should not be interpreted as perfect person-level measurement; rather, they reflect the adequacy of the sample for establishing item order [21].

Across the knowledge items, infit MNSQ values ranged from 0.89 to 1.10, outfit MNSQ values ranged from 0.77 to 1.25, and point-measure correlations ranged from 0.30 to 0.65. Across the practice items, infit MNSQ values ranged from 0.89 to 1.05, outfit MNSQ values ranged from 0.89 to 1.10, and point-measure correlations ranged from 0.62 to 0.72. All point-measure correlations were positive, and no item was removed from either domain (Table 3). The item-fit bubble charts showed that the item outfit MNSQ values were concentrated around the model-expected value of 1.0 (Figure 1).

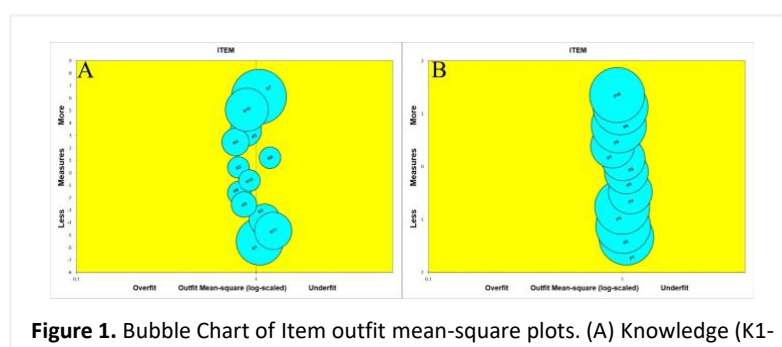
**Figure 1.** Bubble Chart of Item outfit mean-square plots. (A) Knowledge (K1-

Table 3. Rasch item fit statistics and point-measure correlations for the knowledge and practice domains.

Item	Description	Infit		Outfit		Point Measure Correlation
		MNSQ	ZSTD	MNSQ	ZSTD	
K1	Antipsychotic medications can be sold as over-the-counter (OTC) medicines	0.97	-0.1	1.05	0.3	0.32
K2	The use of antipsychotic medications should be discontinued once the patient no longer exhibits signs and symptoms	0.96	-0.8	0.8	-0.9	0.65
K3	Atypical antipsychotics are more frequently associated with neurological adverse effects than typical antipsychotics	1.07	0.7	0.88	-0.3	0.52
K4	Patients with diabetes mellitus are safer when treated with atypical antipsychotics than with typical antipsychotics	0.9	-1.2	0.77	-0.8	0.62
K5	One of the major adverse effects of conventional antipsychotic medications is extrapyramidal symptoms	1	0.1	1.12	0.5	0.49
K6	Atypical antipsychotics are a classic example of the butyrophenone class, such as haloperidol	1.04	0.6	1.2	1	0.62
K7	As a community pharmacist, antipsychotic therapy is best provided to patients with recurrent signs or symptoms	1.03	0.2	1.04	0.2	0.3
K8	Patients should preferably be prescribed only one class of antipsychotic medication to improve treatment adherence	0.98	-0.3	0.81	-0.9	0.61
K9	Patients who have never received antipsychotic treatment should preferably be started on atypical rather than typical antipsychotics	0.89	-1.4	0.86	-0.5	0.59
K10	Antipsychotic medications from different classes should be prescribed to patients who have experienced psychotic symptoms for more than one year	0.97	-0.2	0.89	-10.2	0.41
K11	Antipsychotic medications must be dispensed only with a prescription	1.1	0.8	1.25	0.8	0.38

All point-measure correlations were positive, confirming that the items functioned in the intended direction and contributed coherently to their respective constructs [22]. These findings supported the retention of all items from a Rasch-fit perspective. However, the extreme outfit standardised value reported for the item stating, “Antipsychotic medications from different classes should be prescribed to patients who have exhibited symptoms of psychosis for more than a year,” should be verified against the original Winsteps output because it may represent either a transcription error or the sensitivity of standardised fit statistics to the large sample size.

The knowledge-item hierarchy provided clinically relevant information beyond conventional total scores. K1, which addressed whether antipsychotics could be supplied as over-the-counter medicines, was the easiest item, suggesting that the prescription-only status of these medicines was widely recognised [23]. K7, concerning the provision of antipsychotic therapy to patients with recurrent signs or symptoms, was the most difficult item. Its difficulty may reflect the complexity of interpreting symptom recurrence, treatment continuity, clinical urgency, referral responsibility, and the boundaries of pharmacists’ professional authority [24]. However, the phrase “therapy is best provided” may be interpreted as initiating, continuing, recommending, or dispensing treatment. Cognitive interviewing and wording refinement are therefore warranted to determine whether K7 measures advanced clinical knowledge or semantic ambiguity [25].

The practice-item hierarchy distinguished between overt treatment modification and apparently pragmatic non-prescription supply. P9 and P10 were the most difficult statements to endorse, suggesting greater reluctance to independently switch or select psychotropic therapy [26]. Such decisions require consideration of diagnosis, previous response, adverse-effect profiles, adherence, interactions, and the risk of destabilisation [27]. The item stating, “I prefer to dispense chlorpromazine rather than clonazepam to patients with obesity because chlorpromazine is associated with weight gain,” combines several concepts, including obesity, weight gain, medication selection, and pharmacist prescribing, which may

contribute to its high item location and reduce its interpretability [28]. Further revision is needed before its difficulty can be attributed solely to safer professional judgement.

The statements “Sometimes, I dispense antipsychotics over the counter, especially in emergency situations; for example, when a patient I know has run out of medication and urgently needs it” and “As a pharmacist, I do not request a prescription for antipsychotics when dispensing them to a patient I know” were the easiest practice items to endorse. Both statements reflected non-prescription dispensing in situations involving perceived urgency or familiarity with the patient. This finding is consistent with previous evidence that perceived urgency and familiarity with patients receiving long-term therapy may influence pharmacists’ willingness to supply antipsychotics without valid prescriptions [29]. However, the Rasch hierarchy does not estimate the prevalence of these behaviours and does not establish an individual-level relationship between knowledge and practice [30]. Because no correlational or regression analysis was performed, the present study cannot conclude that pharmacists with greater knowledge demonstrated either safer or less appropriate dispensing. Instead, the findings identify practice circumstances that were comparatively easier or more difficult to endorse and may therefore warrant attention in professional education and regulatory guidance.

The Wright maps placed respondent measures and item measures on the same logit scale (**Figure 2**). In the knowledge domain, item difficulty ranged from approximately -5.5 logits for K1, the easiest item, to approximately +6.0 logits for K7, the most difficult item. In the practice domain, P10 and P9 were the most difficult items to endorse, whereas P1 and P2 were the easiest to endorse. The mean person and item measures were located at approximately 0 logits in both domains, indicating alignment between the overall distribution of respondent measures and item difficulty.

The Wright maps demonstrated satisfactory central targeting, with mean person and item locations positioned near 0 logits in both domains. The knowledge items covered a broad range of difficulty, enabling assessment of both basic regulatory knowledge and

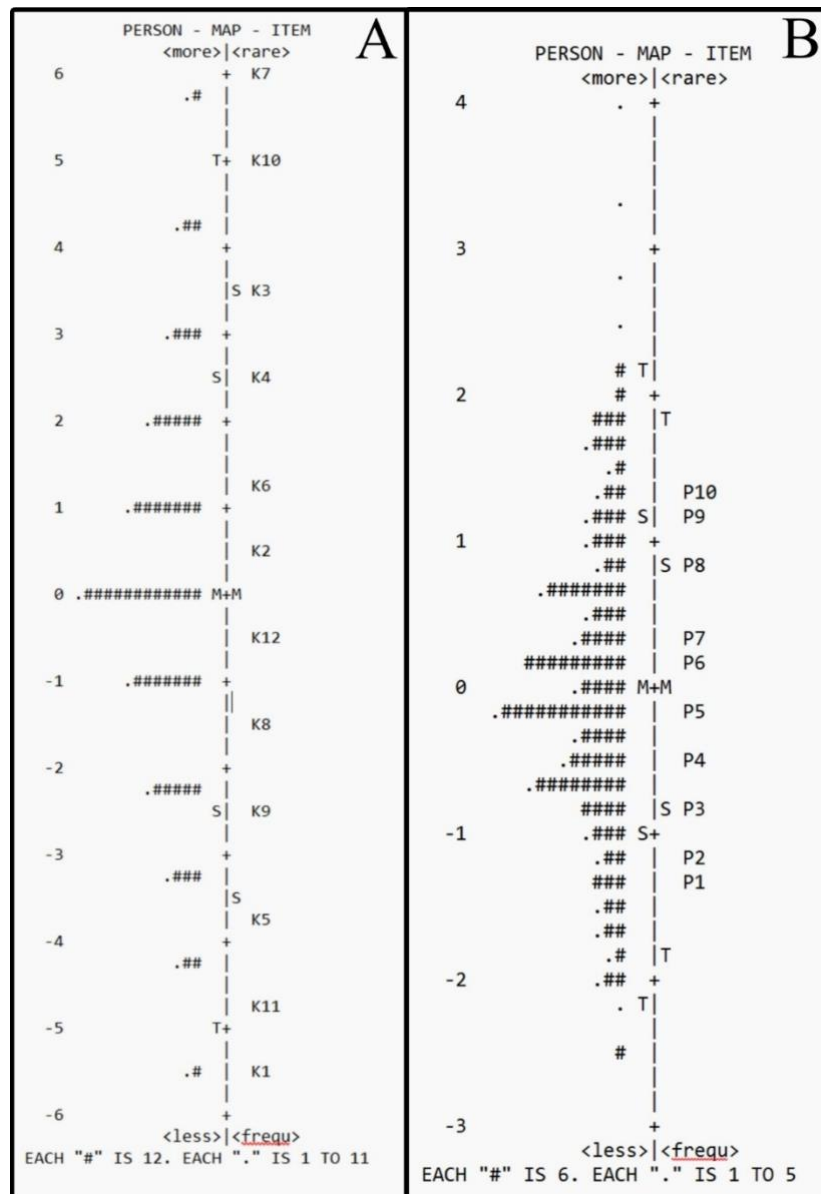


Figure 2. Wright maps of the knowledge and practice domains. (A) Knowledge domain (K1-K12). (B) Practice domain (P1-P10). Items are displayed on the right according to difficulty, and respondents are shown on the left according to ability on the same logit scale. M denotes the mean, whereas S and T indicate one and two standard deviations, respectively.

more complex clinical understanding [31]. Nevertheless, gaps between some item locations may reduce measurement precision at specific points on the continuum. The practice items occupied a narrower difficulty range, while respondent measures extended beyond the most extreme items [32]. Additional practice items targeted at the upper and lower ends of the construct may improve precision for respondents with very low or very high endorsement tendencies.

Differential item functioning was examined to

assess sex-related item bias (male vs. female) across the final 22 item instrument, comprising 12 knowledge items and 10 practice items. **Figure 3** presents the DIF plots for both domains. The male and female item-difficulty estimates were generally closely aligned, and none of the visually estimated DIF contrasts exceeded the moderate-to-large threshold of 0.64 logits. The largest absolute visual difference was approximately 0.60 logits for item K7 in the knowledge domain, which remained below this threshold, whereas differences across the practice items were smaller, generally not exceeding approximately 0.20 logits.

Sex-related differential item functioning analysis provided preliminary evidence of comparable item performance between male and female respondents. No visually estimated contrast exceeded the prespecified moderate-to-large threshold of 0.64 logits [33]. The item stating, "As a community pharmacist, antipsychotic therapy is best administered to patients with symptoms or signs that frequently recur," showed

the largest estimated DIF contrast, approximately 0.60 logits, and should therefore be monitored in subsequent studies. Because item-level standard errors and probability values were unavailable, the analysis could not establish the absence of statistically significant DIF [34]. The findings should be interpreted as showing no visually apparent moderate-to-large sex-related DIF rather than definitive measurement invariance.

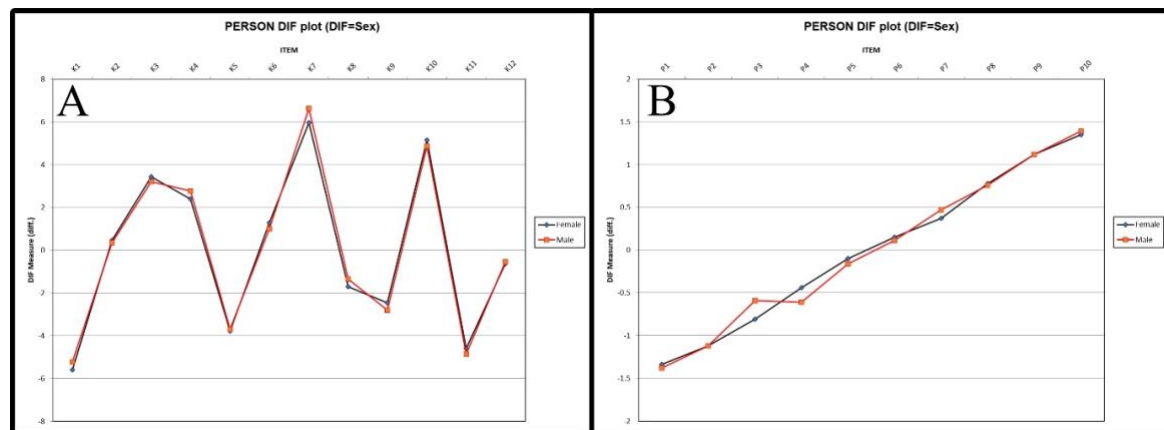


Figure 3. Differential Item Functioning (DIF) plots by sex. (A) Knowledge domain (K1-K12). (B) Practice domain (P1-P10). The plots compare item difficulty estimates between male and female respondents

The instrument may help identify educational needs related to antipsychotic regulation, pharmacology, adverse effects, treatment continuity, prescription requirements, and responses to non-prescription requests. Knowledge and practice should remain separate domains because they represent distinct constructs and demonstrated different reliability, separation, and targeting characteristics. The instrument may also support the evaluation of continuing professional development, regulatory education, pharmacist-prescriber referral pathways, and medication-safety initiatives. However, it should not be used as a stand-alone measure of professional competence or as evidence of actual dispensing behaviour without comparison against direct observation, pharmacy records, or simulated-patient assessments.

Several limitations should be considered. The substantial geographic concentration in western Indonesia restricts national generalisability and prevented robust evaluation of regional measurement invariance. The unequal sex distribution may have affected the precision of DIF estimates. The practice domain relied on self-reported endorsement and may therefore be influenced by social-desirability and recall biases. Formal DIF statistics were unavailable, and DIF was not examined across age, education, professional experience, workplace, or geographic region. Additional analyses of residual dimensionality and local dependence are also needed. Furthermore, K7 and P10

may contain interpretive ambiguity, and the K10 outfit standardised value requires verification. Test-retest reliability, external criterion validity, responsiveness to educational interventions, and replication in an independent and geographically balanced sample were not assessed. Despite these limitations, the findings provide initial support for the instrument as a Rasch-based measure of pharmacists' antipsychotic-related knowledge and self-reported dispensing practices.

CONCLUSION

This study provides initial evidence that the 22-item instrument is a valid and reliable measure of pharmacists' antipsychotic-related knowledge and self-reported dispensing practices in Indonesia. The Rasch analysis demonstrated acceptable item fit, unidimensionality, internal consistency, item-person targeting, and no visually apparent moderate-to-large differential item functioning by sex, although the practice domain showed stronger respondent discrimination than the knowledge domain. The findings also identified clinically relevant gaps, particularly the easier endorsement of non-prescription dispensing in emergency or familiarity-based situations, despite generally adequate knowledge of antipsychotic regulation and use. The instrument may therefore support the identification of educational needs and the evaluation of professional development, regulatory, and medication-safety interventions in community pharmacy practice. Further validation in more

geographically balanced samples, together with formal DIF testing, item refinement, and assessment against observed dispensing behaviour, is needed before widespread national implementation.

CONFLICT OF INTEREST

The authors declare no conflicts of interest regarding this study.

REFERENCES

- [1] Schneider C, O'Mahony D, Byrne S, et al. Prescribing and deprescribing of atypical antipsychotics in older multimorbid patients. *BMC Geriatr* 2025;25.
- [2] Arozal W, Wijaya D, Soetikno V, et al. Treatment patterns of antipsychotics and clinical features for treating patients with schizophrenia at the teaching hospital in Jakarta, Indonesia. *J Appl Pharm Sci* 2019;9:057–63.
- [3] Olasupo J, Taiwo F, Aje A, et al. Knowledge and dispensing practice of community pharmacists towards antipsychotic medicines in a Nigerian metropolitan city—a cross-sectional study. *BMC Health Serv Res* 2023;23:1450.
- [4] Ngcobo NN. Influence of Ageing on the Pharmacodynamics and Pharmacokinetics of Chronically Administered Medicines in Geriatric Patients: A Review: NN Ngcobo. *Clin Pharmacokinet* 2025;64:335–67.
- [5] Rendrayani F, Alfian SD, Wahyudin W, et al. Knowledge, attitude, and practice of medication therapy management: a national survey among pharmacists in Indonesia. *Front Public Health* 2023;11:1213520.
- [6] Aljaffer MA, Alghamdi S, Alkudsi N, et al. A comparison of knowledge, attitude, and practice (KAP) between private-and government-sector pharmacists with regard to psychotropic medications in Riyadh City. *Cureus* 2024;16.
- [7] Ruud T, Drivenes K, Drake RE, et al. The antipsychotic medication management fidelity scale: psychometric properties. *Adm Policy Ment Health Ment Health Serv Res* 2020;47:911–9.
- [8] Kusuma IY, Bahar MA, Nuari DA, et al. Antibiotic knowledge assessment questionnaire in undergraduate pharmacy students: A Rasch analysis of validity evidence. *Pharm Educ* 2024;24:54–78.
- [9] Kusuma IY, Benko R, Bahar MA, et al. Development and validation of a psychometric scale for assessing pharmacy students' perceptions and attitudes toward antimicrobial resistance and antimicrobial stewardship in Indonesia: the PATARAS study. *BMC Med Educ* 2025;25:805.
- [10] Kusuma IY, Triwibowo DN, Pratiwi ADE, et al. Rasch modelling to assess psychometric validation of the knowledge about tuberculosis questionnaire (KATUB-Q) for the general population in Indonesia. *Int J Environ Res Public Health* 2022;19:16753.
- [11] Cotobal-Calvo EM, Mata-Pérez C, Bocchino A, et al. Self-Medication Practice and Associated Factors Among Health Professionals in Spain. *Nurs Rep* 2025;15.
- [12] Paraskevioti EM, Christopoulos A, Mystakidis S, et al. A Conceptual Framework for Mobile Augmented-Reality Storytelling to Support Collaborative Language Learning in Vocational Education and Training. *Multimodal Technol Interact* 2026;10:53.
- [13] Hermanto IM, Mohamad WM, Samatowa L, et al. Rasch-Based Diagnostic Analysis of Biology Education Students' Conceptual Difficulties In Work and Energy. *Islam J Integr Sci Educ IJISE* 2026;5:129–56.
- [14] Khalaf A, Ziad R, Ny P, et al. Psychometric properties of Rosenberg's self-esteem scale among adolescents: A Rasch model analysis. *Front Psychol* 2026;17:1704135.
- [15] Dari T, Fox C, Laux JM, et al. The development and validation of the community-based participatory research knowledge self-assessment scale (CBPR-KSAS): A Rasch analysis. *Meas Eval Couns Dev* 2023;56:64–79.
- [16] Le HTK, Nguyen TTP, Lee SW. Development and validation of the Healthcare Worker Stress Scale-Vietnamese: a culturally grounded instrument to assess work-related stress. *Glob Health Action* 2025;18:2576369.
- [17] Bakkar M, McKay E, Al Rajab M, et al. Mobile Personalized Training in Healthcare: A Quasi-Experimental Study of Knowledge Gains. Available SSRN 6321183 2026.
- [18] Thakur T. Rasch measurement theory: A complete course. Educoback Press; 2025.
- [19] Farrugia L, Azzopardi LM, Debattista J, et al. medicX-KG: a knowledge graph for pharmacists' drug information needs. *J Biomed Semant* 2025;16:11.
- [20] Elsborg P, Melby PS, Kurtzhals M, et al. From global domains to physical activity environments: Development and initial validation of a questionnaire-based physical literacy measure designed for large-scale population surveys. *Meas Phys Educ Exerc Sci* 2024;28:206–23.
- [21] Zhu P, Cook R, Wind S. Item response theory analysis of the cultural humility and enactment scale—supervision. *Meas Eval Couns Dev* 2025;58:114–34.
- [22] Maulana I, Syarah E, Nainggolan E, et al. Validation of Instrument to Measure Pre-Service Science Teachers Digital Skills: Rasch Model. *J Ilm Profesi Pendidik* 2026;11:1987–96.
- [23] Li J, Dong R, Tang M, et al. When Language Models Meet NeuroGraphs: Exploring Enhanced Agentic LLM Framework Towards Brain Network Analysis. *ArXiv Prepr ArXiv260722082* 2026.
- [24] Blenkinsopp A, Duerden M, Blenkinsopp J. Symptoms in the pharmacy: a guide to the management of common illnesses and disease prevention. John Wiley & Sons; 2025.
- [25] Meadows KA, Ferrante N, Geršić T. Cognitive Interviews: Recommendations for Best Practices in Clinical Outcome Assessment (COA) Measure Development and Validation: KA Meadows et al. *Patient-Patient-Centered Outcomes Res* 2025;18:609–21.

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- [26] Kane JM, Agid O, Castle DJ, et al. The use of long-acting injectables for people with schizophrenia: Consensus panel recommendations for overcoming barriers and implementing treatment. *Neurol Ther* 2025;14:2551–81.
- [27] Chang X, Zhu H, Guo Z, et al. Expert consensus on the diagnosis and management of carotid atherosclerotic plaque: pathophysiology, clinical management, and preventive approaches. *Int J Med Sci* 2025;22:2738.
- [28] Steenackers N, Toumazia J, Deleus E, et al. Pharmacotherapy for obesity: are we ready to select, tailor and combine pharmacotherapy to achieve more ambitious goals? *Front Endocrinol* 2025;16:1569468.
- [29] Khalil AI, Almuhalbidi AA, Almutairi RT, et al. Psychiatric nurses versus psychiatrists and pharmacists' knowledge on polypharmacy practices in psychiatry: An interprofessional mixed-methods exploration. *PLoS One* 2026;21:e0327104.
- [30] Frank L, Gossen M, Otto S. A scale for measuring consumer knowledge of fashion sustainability. *Int J Fash Des Technol Educ* 2026:1–9.
- [31] Ling C, Zhao X, Lu J, et al. Domain specialization as the key to make large language models disruptive: A comprehensive survey. *ACM Comput Surv* 2025;58:1–39.
- [32] Guad RM, Mangantig E, Low WY, et al. Development and validation of a structured survey questionnaire on knowledge, attitude, preventive practice, and treatment-seeking behaviour regarding dengue among the resident population of Sabah, Malaysia: an exploratory factor analysis. *BMC Infect Dis* 2021;21:893.
- [33] Fan C-W, Lin P-C, Yen C-F, et al. Psychometric Properties of the Adult Executive Functioning Inventory: Application of Rasch Analyses. *Brain Behav* 2026;16:e71453.
- [34] Gempp R, González-Carrasco M. Psychometric evaluation of the brief multidimensional students' life satisfaction scale (BMSLS) in Chilean early adolescents: an item response theory analysis. *Front Psychol* 2025;16:1638017.



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