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The Adelphi Adherence Questionnaire (ADAQ©): Psychometric Validation of a New Patient Self-Report Measure of Medication Adherence Across Multiple Disease Areas

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Objective:

> Medication adherence is defined as the extent to which a patient takes medication as prescribed and as agreed with the prescribing healthcare professional.[1,2]

> Many existing patient-reported outcome (PRO) measures of medication adherence are not appropriate for use across multiple conditions and treatment regimens/modes. Furthermore, often a limited range of the forms and drivers of medication adherence are assessed and only a few have evidence of content validity.[3-5]

> A novel, generic, medication adherence PRO measure (the Adelphi Adherence Questionnaire; ADAQ©) was developed for a range of therapy areas and treatment modalities/schedules.

> The ADAQ© was developed based on a literature review to identify important medication adherence concepts, review of existing adherence measures, and concept elicitation (CE) and cognitive debriefing (CD) interviews with patients with diverse conditions in Spain, Germany, and the US.[6-7]

> Measurement properties of the ADAQ© were evaluated across multiple disease areas, modes of administration, and treatment regimens.

ADAQ©

The ADAQ© includes four items to assess medication adherence behaviours, including the frequency of missed doses, and taking medication at a different time of day, taking more medication, and taking less medication, than prescribed.

In addition to adherence behaviours, seven items access important drivers which may influence medication adherence, including an optional item assessing the impact of cost on medication adherence (for use in relevant countries).

Respondents are required to select a suitable response for all items on a 5-point verbal descriptor scale.

Methods:

> Data were drawn from the Adelphi Real World Disease Specific Programmes™ (DSP; cross-sectional surveys conducted in the USA) in Atopic Dermatitis (AD; N=180), Heart Failure (HF; N=544), Human Immunodeficiency Virus (HIV; N=247), Multiple Sclerosis (N=1337), and Osteoarthritis (OA; N=723).[8-10]

> Across each DSP, initial exploration of item response distributions and inter-item polychoric correlations were examined. Latent variable modelling was used to evaluate the ADAQ© measurement model (Figure 1) across disease areas (including exploratory and confirmatory factor analysis, bifactor modelling, exploratory graph analysis, Item Response Theory, and Mokken scaling).

> Reliability was estimated using coefficients alpha and omega.

> Convergent validity was evaluated using Spearman's and polyserial correlations with the Adherence to Refills and Medications Scale (ARMS)[11] and clinician-reported adherence/compliance where available.

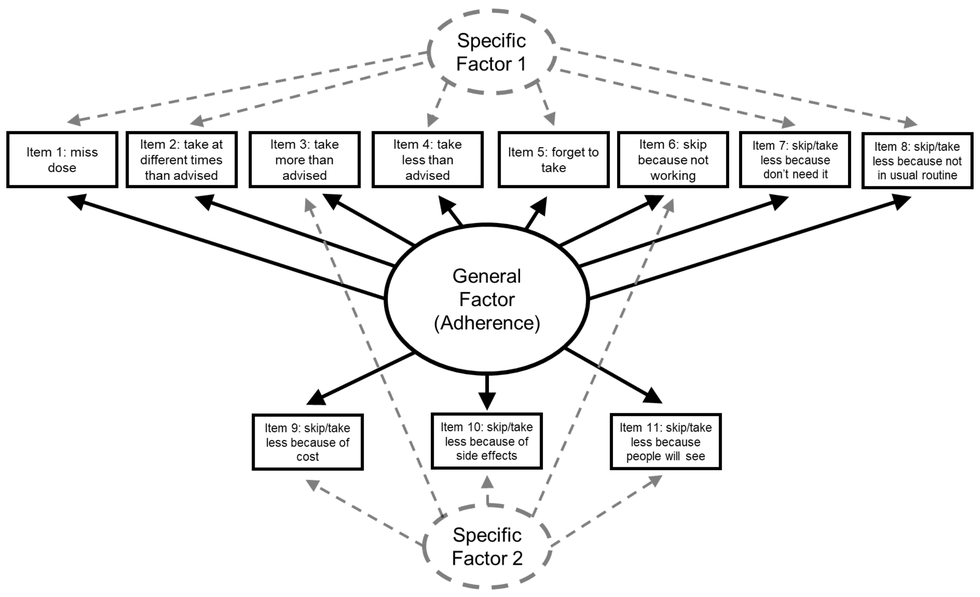

Figure 1. Illustration of bifactor model with General Adherence Factor (bolded oval) loading on all items (bolded arrows) and 2 specific factors (dashed oval) and loading on specific items (dashed arrows).

Note: Specific pathways for item loadings varied across DSPs and are illustrative of AD DSP bifactor model. Item 12 and 13 (patient's confidence that they are taking their medication correctly and perception of overall adherence) do not contribute to score.

References

1. World Health Organization. Adherence to long-term therapies: evidence for action. World Health Organization; 2003. **2.** FDA. Are you taking medication as prescribed? https://www.fda.gov/consumers/consumer-updates/are-you-taking-medication-prescribed. Published 2009. Accessed 18/02/2021. **3.** Cahir C, Dombrowski SU, Kennedy MJ, Sharp L, Bennett K. Developing and validating a theoretical measure of modifiable influences on hormonal therapy medication taking behaviour in women with breast cancer. Psychology & health. 2017;32(10):1308-1326. **4.** Garfield S, Clifford S, Eliasson L, Barber N, Willson A. Suitability of measures of self-reported medication adherence for routine clinical use: a systematic review. BMC medical research methodology. 2011;11(1):1-9. **5.** Unni EJ, Olson JL, Farris KB. Revision and validation of Medication Adherence Reasons Scale (MAR-Scale). Current medical research and opinion. 2014;30(2):211-221. **6.** Morgan L, Exall E, Bentley S, et al. Qualitative interviews to explore drivers and behaviours associated with medication non-adherence across a range of diseases, treatment modalities, and countries International Society of Patient Reported Outcomes (ISPOR) EU; 16-19 November, 2020; Virtual. **7.** Bentley, S., Morgan, L., Exall, E., Arbuckle, R., Rossom, R. C., Roche, N., ... & Piercy, J. (2022). Qualitative Interviews to Support Development and Cognitive Debriefing of the Adelphi Adherence Questionnaire (ADAQ©): A Patient-Reported Measure of Medication Adherence Developed for Use in a Range of Diseases, Treatment Modalities, and Countries. *Patient preference and adherence*, 2579-2592. **8.** Anderson P et al. (2008) Curr Med Res Opin. 24(11):3063-72 **9.** Babineaux SM et al. (2016) BMJ Open. 6:e010352. **10.** Higgins V et al. (2016) Diabetes Metab Syndr Obes 9:371–380. **11.** Lomper K, Chabowski M, Chudiak A, Bialoszewski A, Dudek K, Jankowska-Polanska B. Psychometric evaluation of the Polish version of the Adherence to Refills and Medications Scale (ARMS) in adults with hypertension. Patient Prefer Adherence. 2018;12:2661-2670. **12.** Stucky, Brian D., David Thissen, and Maria Orlando Edelen. 2013. "Using Logistic Approximations of Marginal Trace Lines to Develop Short Assessments." *Applied Psychological Measurement* 37 (1): 41–57. **13.** Stucky, Brian D., and Maria Orlando Edelen. 2015. "Using Hierarchical IRT Models to Create Unidimensional Measures from Multidimensional Data." *Handbook of Item Response Theory Modeling: Applications to Typical Performance Assessment.* 465: 183–206.

Results:

> Consistent with previous research, potential item-level ceiling effects were observed across disease areas (i.e., large proportions of patients selecting the most adherent response for an item).

> Latent variable modelling consistently indicated that an 11-item scoring of the ADAQ© provided the appropriate model fit across studies, with Mokken scaling indicating essential unidimensionality; a bifactor model with 2 specific factors (Figure 1) achieved acceptable model fit across all disease areas.

> ADAQ© items were subsequently evaluated using an index of explained common variance (IECV), which acts as an assessment of unidimensionality at the individual item-level by describing the extent to which an item's responses are accounted for by variation on the latent general dimension.[12]

> IECV results are shown in Table 1. Taken together, IECV values were considered acceptable with all items achieving IECVs > 0.8 [13] across at least two disease areas, and the majority of items reaching this threshold across all 5 DSP/disease areas. IECVs of notably low value were rare, but included Item 1 (miss a dose) in HIV and Item 10 (not wanting to be seen taking medication) in AD.

Table 1. IECV values for ADAQ© items for bifactor model with 2 specific factors across each disease area.

	AD	HF	HIV	MS	OA
Item 1: miss dose	0.725	**0.835**	0.408	**0.921**	0.728
Item 2: take at different times than advised	**0.877**	**0.808**	**0.994**	**0.874**	**0.944**
Item 3: take more than advised	**0.888**	**0.998**	**0.734**	**0.985**	**0.804**
Item 4: take less than advised	**0.998**	**0.974**	**0.787**	**0.993**	**0.976**
Item 5: forget to take	**0.808**	**0.887**	**0.936**	**0.874**	**0.834**
Item 6: skip because not working	**0.957**	**0.994**	**0.928**	**0.956**	**0.999**
Item 7: skip/take less because don't need it	**0.985**	**0.974**	**0.912**	**0.942**	**0.961**
Item 8: skip/take less because not in usual routine	**0.884**	**0.868**	**0.966**	**0.95**	**0.901**
Item 9: skip/take less because of cost	0.654	**0.905**	**0.859**	0.667	0.754
Item 10: skip/take less because of side effects	0.448	**0.921**	**0.98**	**0.972**	**0.8**
Item 11: skip/take less because people will see	0.67	**0.909**	**1**	**0.906**	0.715

IECV values > 0.8 bolded; AD = Atopic Dermatitis; HF = Heart Failure; HIV = Human Immunodeficiency Virus; MS = Multiple Sclerosis; OA = Osteoarthritis

> Reliability coefficients omega hierarchical and alpha indicated the ADAQ© has excellent reliability (> 0.9) across all disease areas (Table 2).

Table 2. Internal consistency reliability estimates for bifactor model with 2 specific factors across each disease area.

Dataset	Cronbach's alpha	McDonald's omega (hierarchical)
OA	0.97	0.89
HIV	0.89	0.88
MS	0.98	0.94
HF	0.97	0.92
AD	0.95	0.86

AD = Atopic Dermatitis; HF = Heart Failure; HIV = Human Immunodeficiency Virus; MS = Multiple Sclerosis; OA = Osteoarthritis

> Convergent validity (Table 3) was demonstrated with the ADAQ© scores showing moderate-to-strong correlations with ARMS scores (0.591 in HIV to 0.774 in OA), and moderate correlations with clinician-reported adherence/compliance (all >|0.3|).

Table 3. Convergent validity results for the 11-item ADAQ

Dataset	ARMS Total (S)	ARMS Taking Medication as Prescribed (P)	ARMS Refilling Medications on Schedule (P)	Physician-reported Adherence (P)	Physician-reported Compliance (P)	Physician-reported Satisfaction (P)	Patient-reported Satisfaction (P)
OA	0.774	0.798	0.382	0.448	-0.345	0.18	-0.298
HIV	0.591	0.833	0.821	0.516	-0.626	N/A	-0.287
MS	0.663	0.771	0.752	0.477	-0.51	N/A	-0.400
HF	0.659	0.773	0.773	0.613	-0.573	0.269	0.299
AD	0.699	N/A	N/A	N/A	N/A	-0.261	-0.335

S=Spearman's rank, P=polyserial; AD = Atopic Dermatitis; HF = Heart Failure; HIV = Human Immunodeficiency Virus; MS = Multiple Sclerosis; OA = Osteoarthritis; ARMS = Adherence to Refills and Medications Scale

Conclusions:

> Evidence across multiple disease areas provides strong psychometric evidence that the 11-item ADAQ© is a unidimensional, reliable, and valid measure of patient-reported adherence to medication.

> The ADAQ© addresses an unmet need for a generic medication adherence measure for use across a variety of conditions in real-world studies and routine clinical practice.

> Further validation in other disease populations is recommended to confirm if the measurement properties are consistent across populations.

> Future research could assess test-retest reliability and explore the possibility of establishing interpretation guidelines for the ADAQ© score.

For more information about the ADAQ© please contact: ADAQ@adelphigroup.com

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