

Psychometric Validation of the ABOUT–Dependence : A Fit-for-Purpose Instrument to Assess Global Dependence on Tobacco and Nicotine Products

C. Chrea¹, T. Salzberger², L. Abetz-Webb³, E.F. Afolalu¹, S. Cano⁴, J. Rose⁵, R. Weitkunat¹, K. Fagerström⁶

¹ PMI R&D, Philip Morris Products S.A., Quai Jeanrenaud 5, CH-2000 Neuchâtel, Switzerland ² University of Economics and Business, Vienna, Austria ³ Patient-Centered Outcomes Assessments, Ltd, Macclesfield Cheshire, UK ⁴ Modus Outcomes, Letchworth Garden City, UK ⁵ Rose Research Center, Raleigh, NC, USA ⁶ K. Fagerström Consulting AB, Vaxholm, Sweden

Introduction and Objectives

The measurement of nicotine dependence has primarily focused on assessing product-specific dependence (notably cigarettes) rather than overall nicotine dependence on tobacco and nicotine products (TNPs).

Considering the range of TNPs currently available and the growing prevalence of multiple product use, existing instruments are not fit-for-purpose to enable valid comparisons of dependence across different products and in users of multiple products.

To address these limitations, the development of the **ABOUT–Dependence** instrument was initiated as part of the **ABOUT™ Toolbox¹ (Assessment of Behavioral Outcomes related to Tobacco and nicotine products)** initiative.

Here, we describe the initial assessment of the psychometric properties of the draft instrument.

Methods and Analysis

A cross-sectional, internet-based survey with purposive stratified sampling of adults legally authorized to purchase TNPs in the United States (N = 2434).

A comprehensive **psychometric assessment** was based on application of **Rasch Measurement Methods (RMM)** and techniques rooted in Classical Test Theory.

Measures included a cognitively debriefed 19-item draft of the ABOUT–Dependence instrument, existing product-specific dependence instruments as measures for convergent validity, and questionnaires on individual characteristics as measures for concurrent validity.

As a measure of test-retest reliability, a subsection of participants (n = 1421) completed Wave 2 survey assessment seven to 10 days after Wave 1.

Results

Demographics and TNP use: The sample was recruited in order to have single users (defined as current self-reported users of only one type of TNP) and poly-user participants who reported current use of two or more TNPs (Table 1).

Table 1: Overview of the sample demographics and TNP use characteristics for the cross-sectional survey at Wave 1.

Characteristics	Single users n = 1181	Poly-users n = 1253	Total sample n = 2434
Age			
Mean (SD)	52.1 (13.9)	45.9 (13.0)	48.9 (13.8)
18–34 years, n (%)	155 (13.1)	305 (24.3)	460 (18.9)
35–49 years, n (%)	352 (29.8)	462 (36.9)	814 (33.4)
50 years and more, n (%)	674 (57.1)	486 (38.8)	1160 (47.7)
Gender, n (%)			
Female	442 (37.4)	532 (42.5)	974 (40.0)
Male	739 (62.6)	721 (57.5)	1460 (60.0)
Race/ethnicity, n (%)			
Black	66 (5.6)	148 (11.8)	214 (8.8)
White	1011 (85.6)	961 (76.7)	1972 (81.0)
Other	104 (8.8)	144 (11.5)	248 (10.2)
Education level n (%)			
High-school and below	189 (16.0)	141 (11.3)	330 (13.6)
Some college or college degree	459 (38.9)	507 (40.5)	966 (39.7)
Bachelor's degree and beyond	533 (45.1)	605 (48.3)	1138 (46.8)
TNP currently used, n (%)			
Cigarette	250 (21.2)	932 (74.4)	1182 (48.6)
Cigars/cigarillos	250 (21.2)	529 (42.2)	779 (32.0)
E-cigarettes	252 (21.3)	775 (61.9)	1027 (42.2)
Smokeless tobacco	250 (21.2)	265 (21.1)	515 (21.2)
Others (pipe, waterpipe, NRT)	179 (15.2)	481 (38.4)	660 (27.1)

Results

Item Fit and Dimensionality. Psychometric evaluation of the first-draft version led to a 12-item version of the instrument consisting of three main domains (Table 2): **extent-of-use [timing]** (two items), **behavioral evaluation “doing”** (five items), and **attitudinal evaluation “feeling”** (five items). Summary of item reduction and revised conceptual framework has been previously described.² Findings also supported the summation of items to form a subscale score for each of the multi-item domains and a composite score across domains. The multidimensionality was also confirmed by traditional principal axis factor analysis.

Reliability. Cronbach alpha, RMM person separation index (PSI), and test-retest correlations between Wave 1 and Wave 2 for the domains are shown in Table 2.

Table 2: Reliability and test-retest values based on psychometric validation and summary of instrument items and domains.

Domain	Reliability		Test-retest Wave 1 and Wave 2 (n = 1421)		Items
	Cronbach alpha	PSI	Pearson's r	Intraclass correlation	
Extent-of-use	0.83	0.73	0.78	0.78	how soon after woke up; how long before sleep
Doing	0.89	0.81	0.79	0.79	use more than intended; use in situation not supposed to; sneak off to use; avoid an activity; stop what you were doing
Feeling	0.91	0.89	0.84	0.83	need to function “normally”; difficult to completely quit; strong desire to use; HAD to have one; hard to control the need or urge
Composite score of domains corrected for DIF	-	0.82	0.82	0.82	

Suitability and Targeting. Person measurements were well covered, and response option thresholds were ordered as expected.

Differential Item Functioning (DIF). “Extent-of-use” was differently related to the domains of “doing” and “feeling” for different TNPs. Given the same dependence, DIF was noted, as e-cigarette users reported higher extent of use, waterpipe and cigar users reported lower extent of use, and other TNPs were very similar with regard to extent of use.

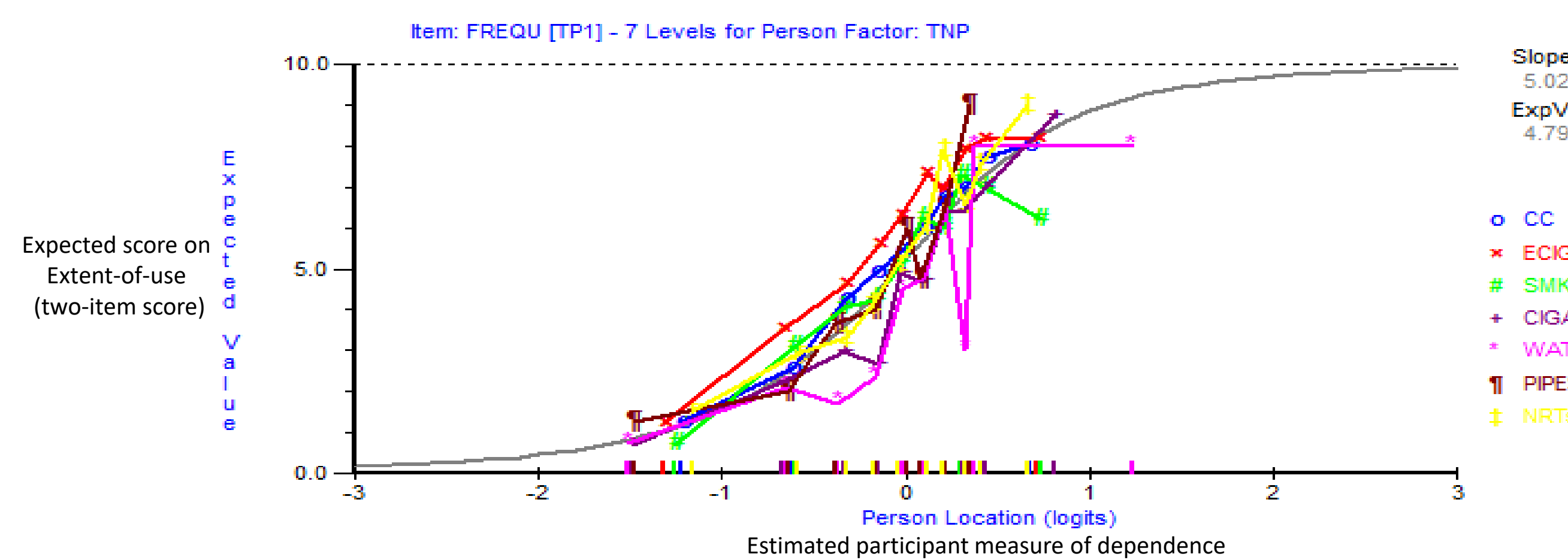


Figure 1: DIF for “extent of use” domain across different TNPs.

Convergent Validity. Validity of the new instrument was supported by good correlation with existing dependence measures (Table 3).

Table 3: Correlations between ABOUT–Dependence and existing dependence measurement instruments.

ABOUT-Dependence		Wave 1 single users (n)	Pearson's r
Cigarette	Fagerström Test for Nicotine Dependence (FTND) for cigarettes	250	0.70
	Wisconsin Inventory Dependence Measure-brief version	248	0.77
	Cigarette Dependence Scale (CDS-5)	243	0.69
E-Cigarette	Penn State Electronic Cigarette Dependence Index	251	0.67
	CDS-5 adapted for E-Cigarettes	242	0.65
Smokeless tobacco	Fagerström Test for Nicotine Dependence for smokeless tobacco	250	0.65
Cigars/Cigarillos	CDS-5 adapted to smokeless tobacco	238	0.80
	FTND adapted to cigars/cigarillos	248	0.64
Waterpipe	CDS-5 adapted to cigars/cigarillos	224	0.76
	Lebanon Waterpipe Dependence Scale	42	0.68
Pipe	CDS-5 adapted to waterpipe	42	0.46
NRT	CDS-5 adapted to pipe	45	0.68
	CDS-5 adapted to NRT	86	0.48

Results

Known Groups Validity. ABOUT–Dependence scores differed by key demographic and product use patterns, indicating known groups validity (Figures 2-4 show mean estimates on the Rasch logic metric with error bars (standard error of mean)).

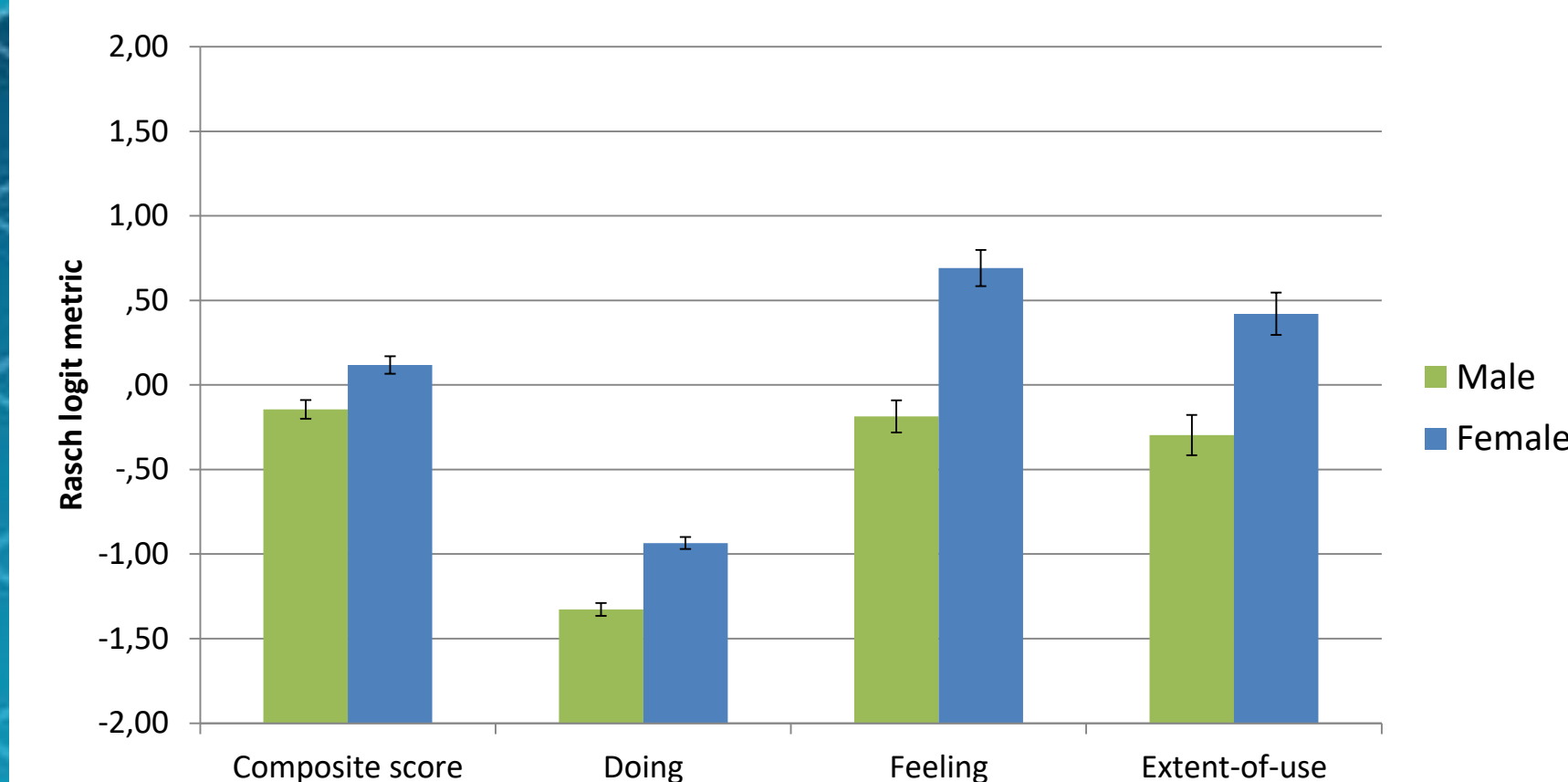


Figure 2: ABOUT–Dependence scores by sex.

Female participants reported higher dependence than males. Studies have suggested a faster neurophysiological uptake of nicotine for females compared to males, increasing the likelihood of greater nicotine dependence in females.³

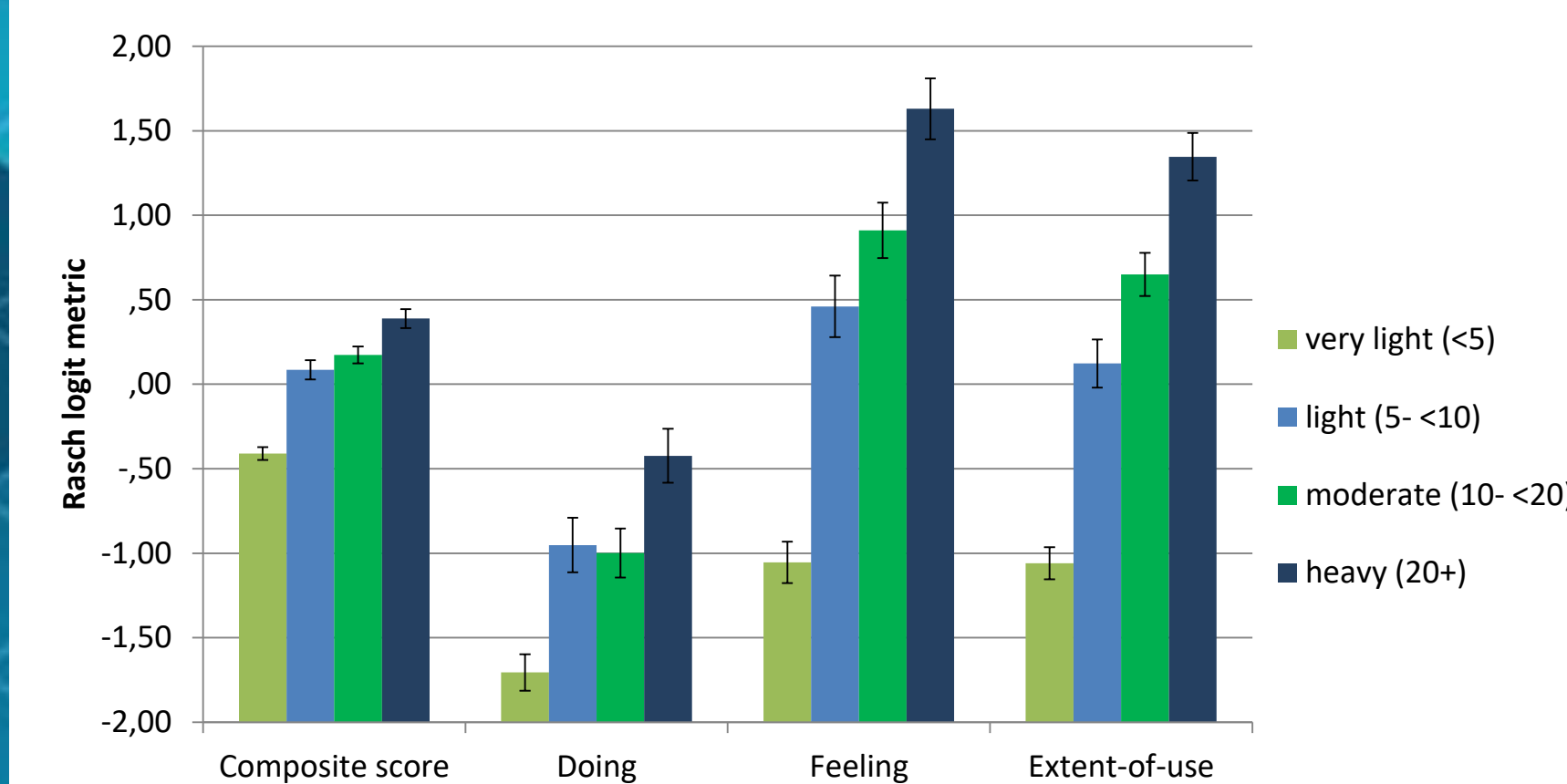


Figure 3: ABOUT–Dependence scores by intensity of use (single users).

As the number of units consumed per day increases, dependence increases. These results are consistent with previous findings that greater consumption of TNPs is associated with dependence.⁴

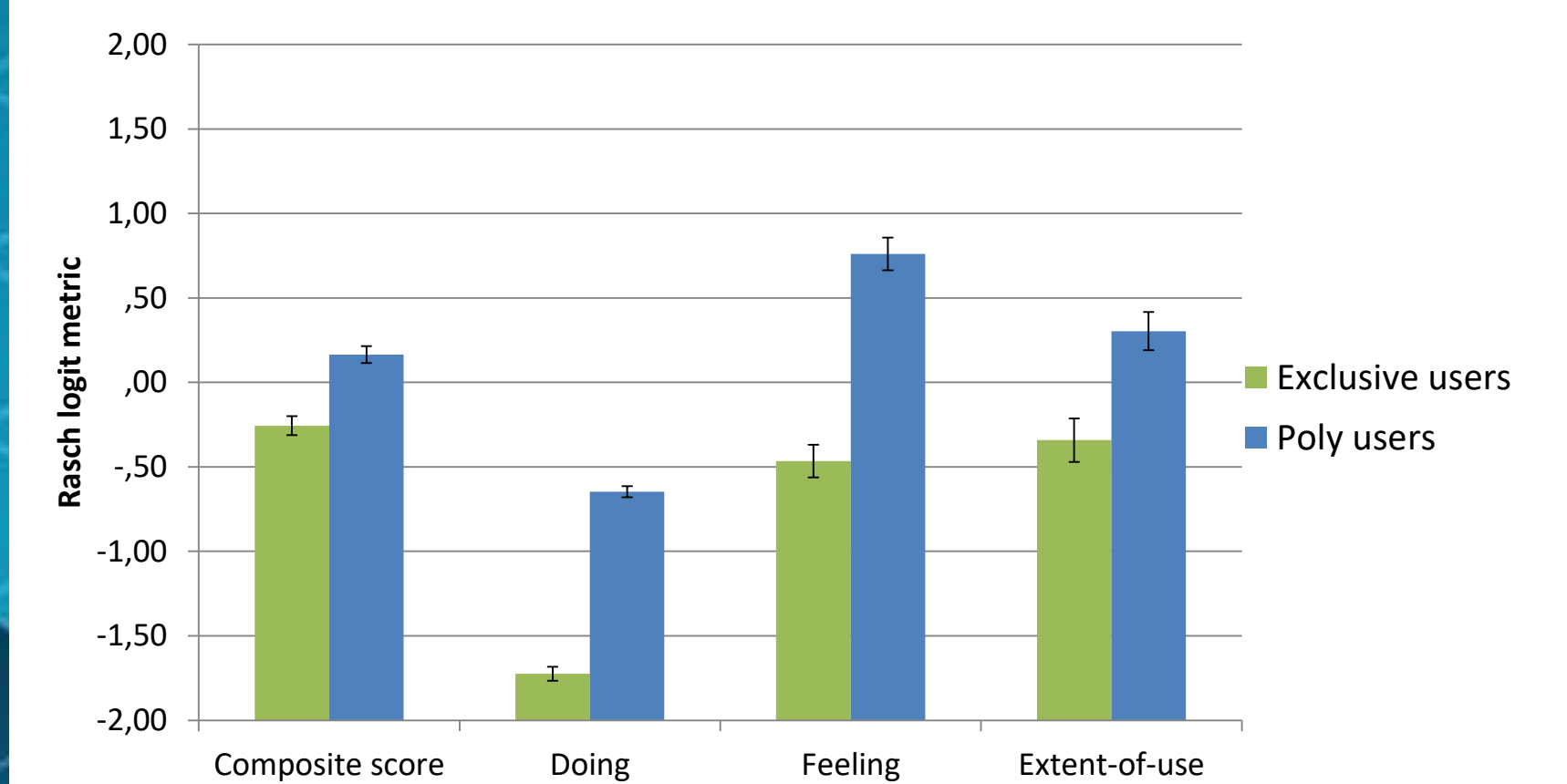


Figure 4: ABOUT–Dependence scores by user type.

The instrument showed different levels of dependence across product user types. Poly-users reported higher dependence than single users, which is in agreement with previous studies reporting greater likelihood of nicotine dependence symptoms among multiple product users.^{5,6}

Conclusions

The ABOUT–Dependence instrument shows utility to advance the understanding and measurement of nicotine dependence on the whole spectrum of TNPs and user types.

Psychometric analysis of the instrument provided empirical support for a three-domain structure of dependence. Further investigations will aim at a better conceptual interpretation of nicotine dependence scores and to ensure the validity of the instrument across specific TNPs.

The ABOUT–Dependence instrument will be made available on PROQOLID™ to the scientific community upon finalization of the user manual and scoring rules as well as development of a crosswalk to aid interpretation of scores on the instrument and existing dependence instruments on a common metric.

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