

CROM Symposium 2020

Consumer Reported Outcome Measures
in Tobacco and Nicotine Research

December 10, 2020 | 4:00 - 7:00 pm CET

A Virtual Event

Establishing traceability of self-reported dependence measurement through the use of crosswalks

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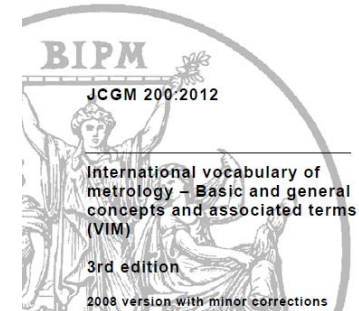
Self-report instruments to measure dependence

- Status quo
- Limitations and challenges
- New scale development: the ABOUT™–Dependence



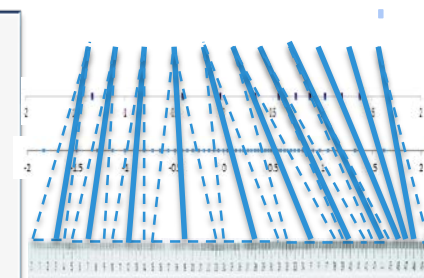
Metrological traceability

- Traceability and uncertainty are fundamental concepts in metrology, the science of measurement
- Traceability: Relating the result of measurement to a reference
- Comparability of measurements based on different instruments



Crosswalk

- Establishing a common metric for measurements based on different instruments
- Ensuring comparability of measurements



Self-reported dependence measurement



Background

- Range of new tobacco and nicotine-containing products (TNPs)
- Less harmful TNPs as a better alternative to smoking if smoking otherwise continued
- All TNPs are a potential source of dependence

Measurement of dependence

- First instruments refer to use of cigarettes (e.g., Fagerström Tolerance Questionnaire - FTQ; Fagerström Test for Nicotine Dependence - FTND)
- Today, range of instruments tailored to a specific TNP (e.g., cigarettes, e-cigarettes)
- Typically framed as measuring perceived product dependence rather than dependence on nicotine
- Comparative measurement difficult, some approaches refer to a specific comparison of two TNPs

Problems and challenges

- Comparability of perceived dependence associated with the use of different TNPs hampered by incommensurable metrics from different instruments (*exclusive users*)
- More widespread concurrent use of more than one TNP (*poly users*)
- No instrument fit for purpose, research gap



Development of the ABOUT–Dependence

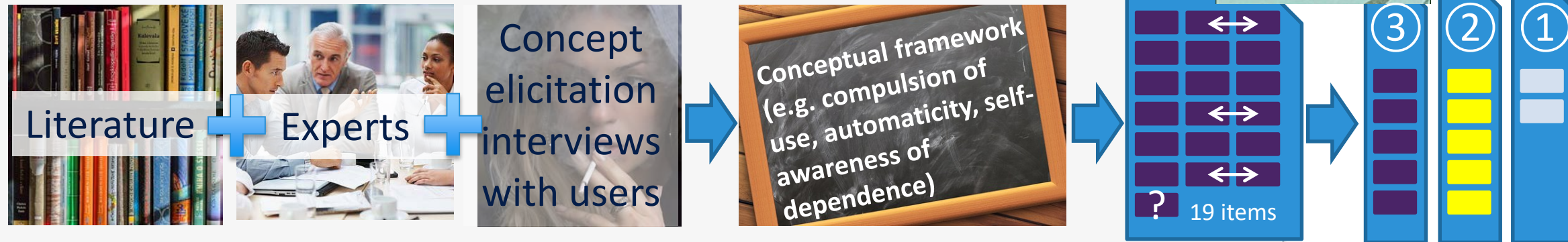


Objectives

- Measure perceived dependence among exclusive users of various TNPs & users of multiple TNPs (poly users)
- Establish a common metric allowing for comparability



Instrument development in a nutshell



- Presented at CORESTA SSPT 2019 Conference Hamburg, Germany, 7th October 2019 (Afolalu et al.)

ABOUT–Dependence

- 12-item instrument capturing three related domains:
 - ① extent-of-use, ② signs and symptoms, ③ behavioural impact
- Three domain scores
- One overall score (ABOUT Dependence Index) capturing holistic concept of self-reported dependence
- Common metric of perceived dependence (exclusive users, poly users)



Consolidating perceived dependence measurement



Objectives

- Link past and future research
- Accommodate the continued use of legacy instruments (high product-specificity)
- Allow for comparative measurement

Metrological challenge

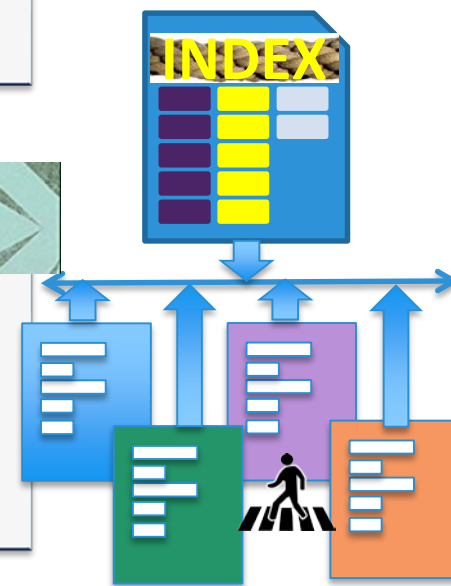
- No replicable measurement unit of self-reported dependence based on some reference or principle (yet)
- Measurement instruments need to be linked to one another directly (“horizontally”) - crosswalks



Psychometric procedure based on the Rasch model for measurement*

- Rasch model establishes common metric for person and item parameters (measurements)
- Rasch model disentangles person and item parameters (measurements) by virtue of parameter separation and invariance (specific objectivity): item parameters become (sample-independent) markers on the latent continuum of perceived dependence
- Linking instruments to the same metric by means of co-calibration (equating)

RASCH
MODELS FOR
MEASUREMENT



* Rasch model for polytomous responses (Andrich 1978, 1988)

Building crosswalks: FTND↔ABOUT–Dependence



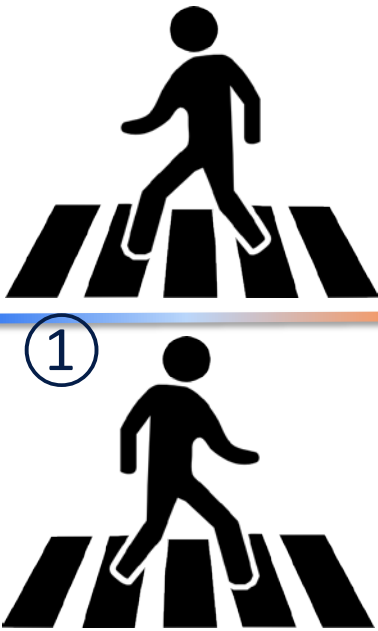
Objectives

- ① Converting a raw score on one instrument to the equivalent raw score on another instrument
- ② Link both instruments to the same linear metric of dependence



Raw score

②



The Fagerström Test for Nicotine Dependence
(FTND; Heatherton et al., 1991; in 2011 renamed *The Fagerström Test for Cigarette Dependence*; Fagerström 2011)

Appendix 1 – Items and scoring for the Fagerström Test for Nicotine Dependence.

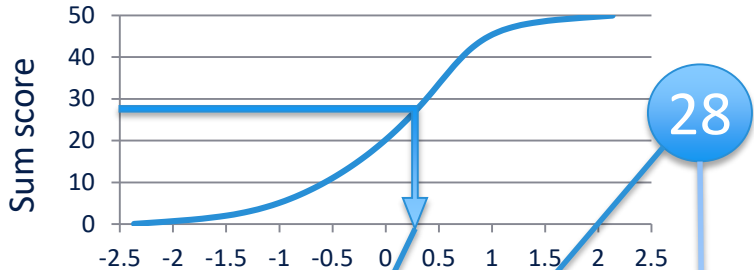
Question	Answers	Points
1. How soon after you wake up do you smoke your first cigarette?	Within 5 minutes 6–30 minutes 31–60 minutes After 60 minutes	3 2 1 0
2. Do you find it difficult to refrain from smoking in places where it is forbidden, e.g., in church, at the library, in the cinema, etc?	Yes No	1 0
3. Which cigarette would you most hate to give up?	The first one in the morning Any other	1 0
4. How many cigarettes/day do you smoke?	10 or less 11–20 21–30 31 or more	0 1 2 3
5. Do you smoke more frequently during the first hour after waking than during the rest of the day?	Yes No	1 0
6. Do you smoke if you are so ill that you are in bed most of the day?	Yes No	1 0

Raw score

②



Building crosswalks: FTND↔ABOUT–Dependence



Common metric established by the ABOUT Dependence

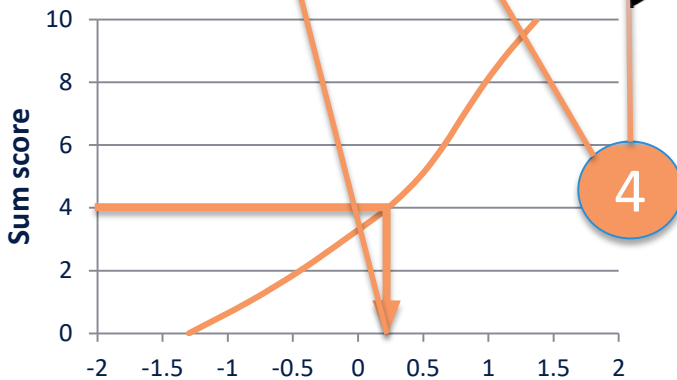
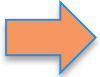
Linear transformation to 0-to-100 scale



The Fagerström Test for Nicotine Dependence (FTND; Heatherton et al., 1991; renamed *The Fagerström Test for Cigarette Dependence*; Fagerström 2011)

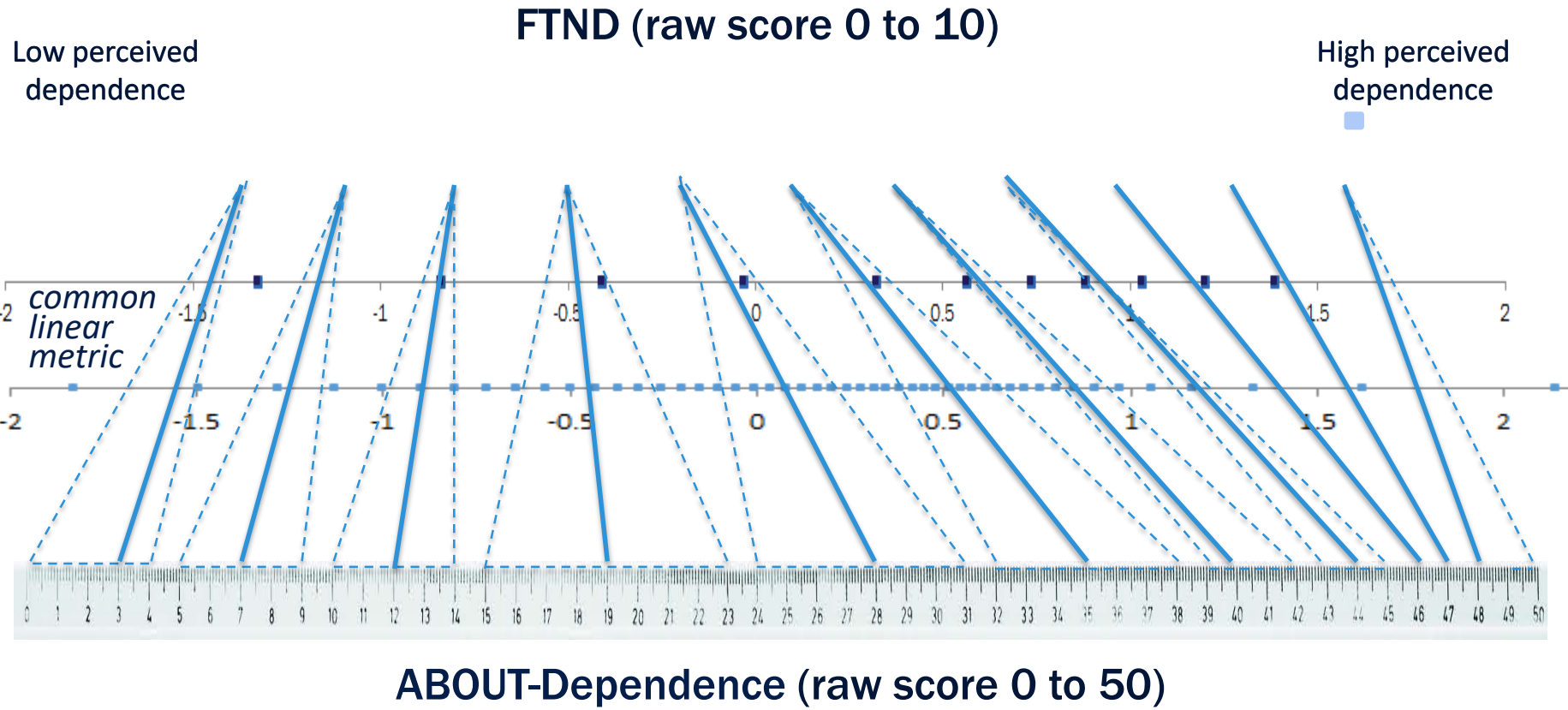
Appendix 1 – Items and scoring for the Fagerström Test for Nicotine Dependence.

Question	Answers	Points
1. How soon after you wake up do you smoke your first cigarette?	Within 5 minutes	3
	6-30 minutes	2
	31-60 minutes	1
	After 60 minutes	0
2. Do you find it difficult to refrain from smoking in places where it is forbidden, e.g., in church, at the library, in the cinema, etc.?	Yes	1
	No	0
3. Which cigarette would you most hate to give up?	The first one in the morning	1
	Any other	0
4. How many cigarettes/day do you smoke?	10 or less	0
	11-20	1
	21-30	2
	31 or more	3
5. Do you smoke more frequently during the first hours after waking than during the rest of the day?	Yes	1
	No	0
6. Do you smoke if you are so ill that you are in bed most of the day?	Yes	1
	No	0



*Permission to use this scale for purposes other than research must be obtained from K.O. Fagerström.

Crosswalk FTND/FTCD ↔ ABOUT Dependence



FTND score	ABOUT Dependence score	Common metric 0-to-100
0	3	27
1	7	36
...
...
10	49	86

Crosswalk

A word on uncertainty



Measurement uncertainty

- Stated range of uncertainty – expressed in a comparable metric
- Standard error of measurement informs about calibration uncertainty of person measurements

Introduction to the Guide of
Uncertainty in Measurement
(GUM)

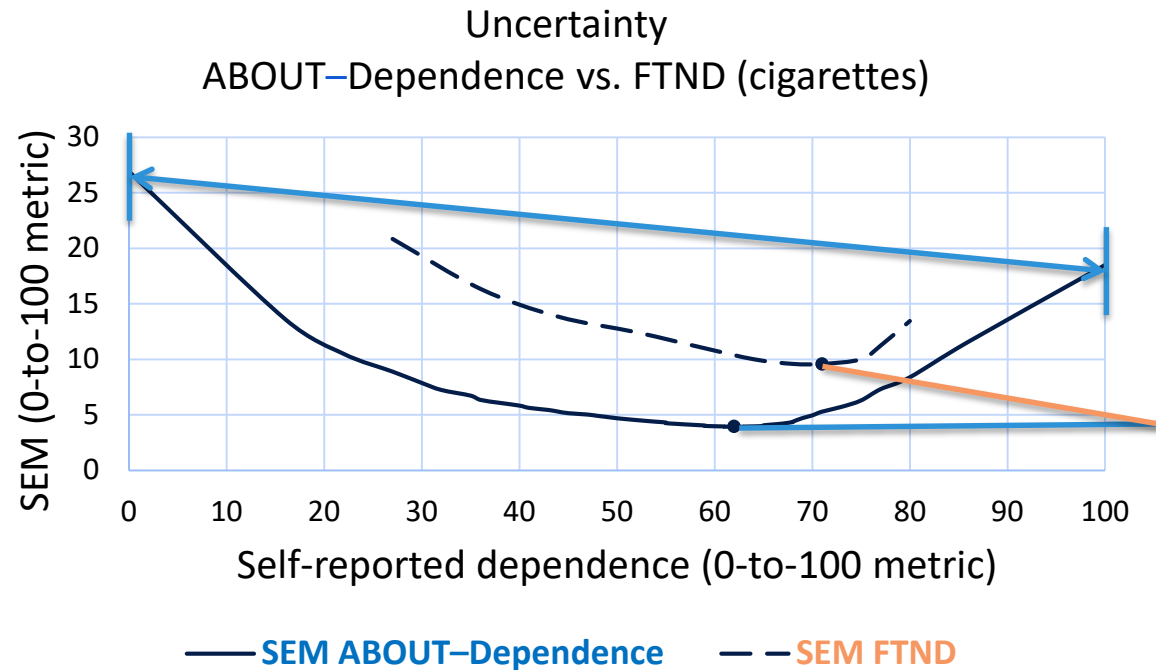


JCGM 100:2008
JCGM 104:2009

Dr M. Meek
Dr D. Van Riet

Bevel Workshop on – Uncertainty in Measurement: Test policy & SEM contributions –
Brussels, 16, 17 and 18 October 2010

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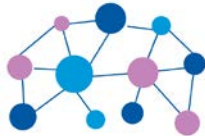


ABOUT

Broader range of measurement

Smaller uncertainty, more precise measurement

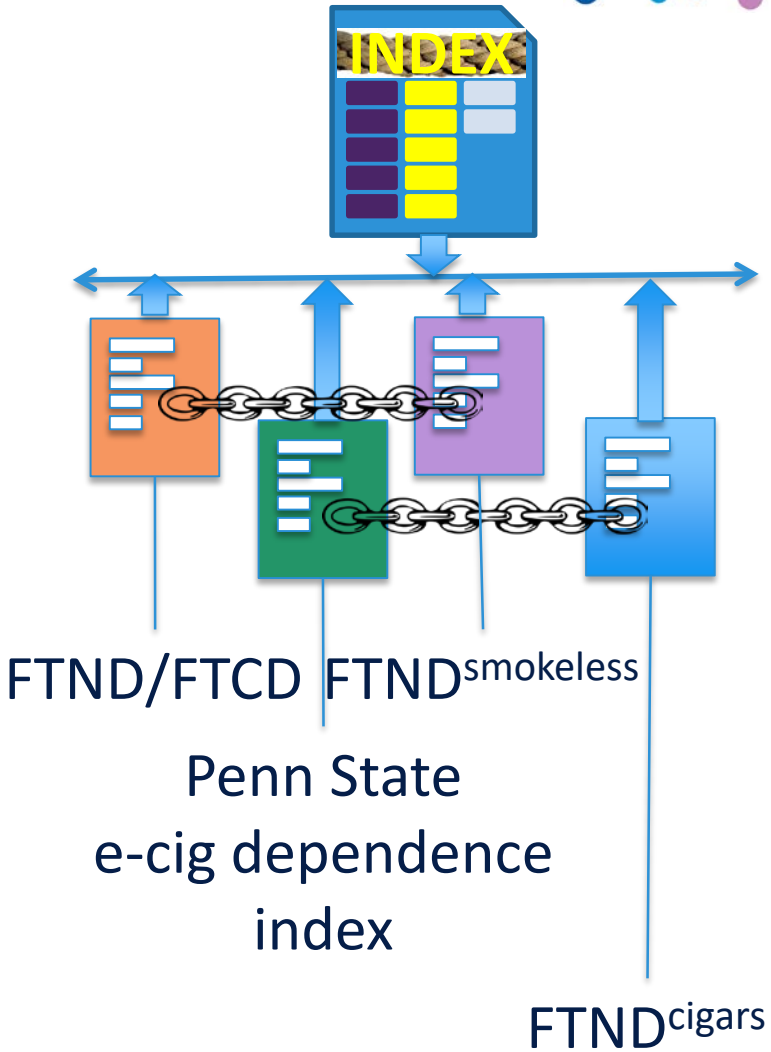
Further crosswalks I



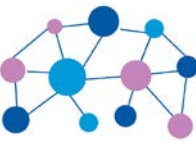
Objectives

- Linking further instruments to the common metric (crosswalks to ABOUT dependence)
- Comparability of scores from third instruments

Raw score (sum across items with lowest category scored 0)					Common metric of self-reported dependence (0-to-100)			
FTND (cigarettes)	Penn State Electronic Cig. Dep. Index	FTND-ST (smokeless tobacco)	FTND-CG (cigars/cigarillos)	ABOUT-Dependence raw score	For Cig.	For e-cig.	For smokeless tobacco	For cigars/cigarillos
If lowest item response category is scored 1 rather than 0, add to the sum scores listed in this table:								
6	10	6	6	12				
[A]	[B]	[C]	[D]	[A]-[D]	[A]	[B]	[C]	[D]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(0)	(0)	(0)	(0)	0	0	0	0	0
(0)	(0)	(0)	(0)	1	16	13	16	16
(0)	0	0	(0)	2	22	20	22	23
0	(0)	(1)	(0)	3	27	25	27	28
(0)	1	1	(0)	4	30	29	30	31
(1)	(1)	1	(0)	5	32	31	32	34
(1)	2	2	(0)	6	35	34	35	36
1	(2)	2	(0)	7	36	36	36	38
(1)	(3)	2	(0)	8	38	38	38	40
(1)	3	(2)	(0)	9	40	39	40	42
(2)	4	(2)	(0)	10	41	41	41	43
(2)	(4)	(2)	(0)	11	43	42	43	45
(2)	5	(3)	(0)	12	44	44	44	46

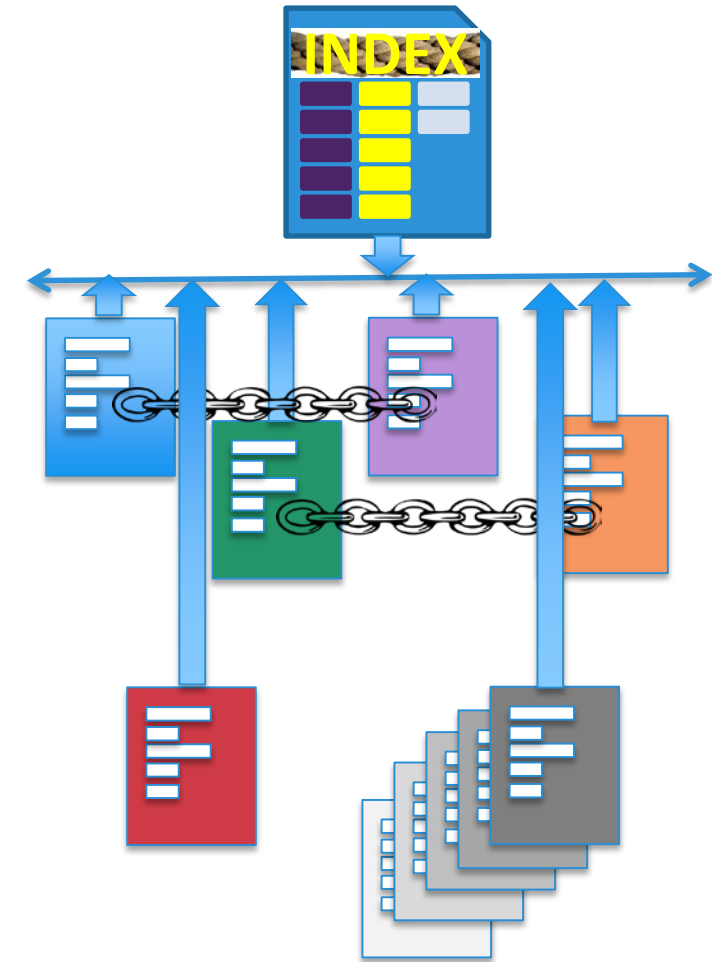


Further crosswalks II



Crosswalks under preparation

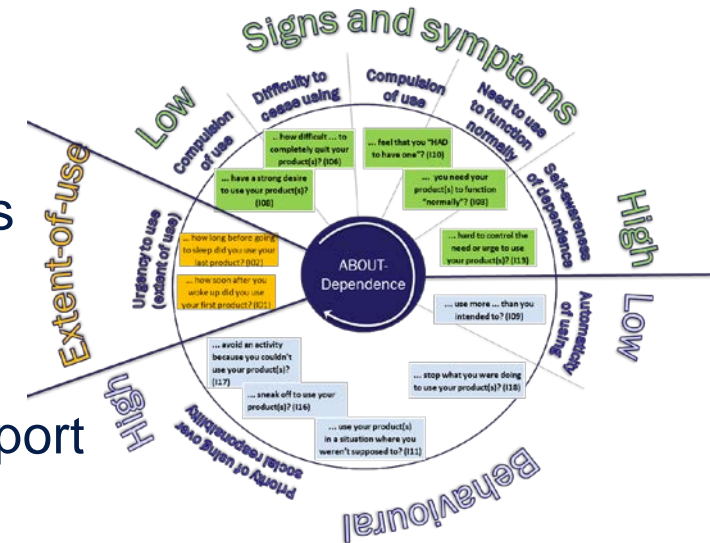
- The Wisconsin Index of Smoking Dependence Motives (WISDM)
- Cigarette Dependence Scale, short version (CDS-5), adapted for several TNPs



Summary

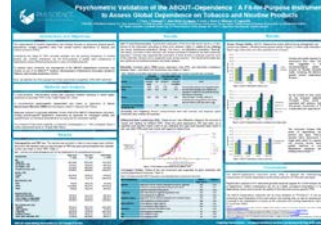


- ✓ The ABOUT–Dependence is a thoroughly developed self-report instrument for perceived dependence associated with the use of TNP based on a scale development process involving qualitative research that informs the conceptual framework
- ✓ The 12-item ABOUT–Dependence Index is a holistic summary self-report measure of perceived dependence involving TNP usage behaviour (extent of use), the behavioural impact of TNP use and perceived signs and symptoms
- ✓ The ABOUT–Dependence fills research gaps (lack of valid measurement of perceived dependence in poly users and lack of comparable measurement across different TNPs)
- ✓ **Crosswalks** allow for linking the ABOUT–Dependence to various legacy instruments that have proved to be useful under certain circumstances, have contributed to research findings, and will continue to be used
- ✓ Thus, crosswalks foster scientific exchange
- ✓ Crosswalks address metrological traceability providing a remedy to a deficiency in social measurement that has compromised progress



Key references

- ✓ Chrea C., Salzberger T., Abetz-Webb L., et al. "Psychometric Validation of the ABOUT-Dependence: A Fit-for-Purpose Instrument to Assess Global Dependence on Tobacco and Nicotine Products. Poster presentation at the Society for Research on Nicotine and Tobacco 25th Annual Meeting, Baltimore, USA (February, 2019).
<https://www.pmiscience.com/library/publication/psychometric-validation-of-the-about-dependence>
- ✓ Chrea C., Salzberger T., Abetz-Webb L., et al. Development of a fit-for-purpose tobacco and nicotine product dependence instrument. Poster presentation at the International Society of Pharmacoeconomics and Outcomes Research 21st Annual European Congress, Barcelona, Spain (November, 2018).
<https://www.pmiscience.com/library/publication/development-of-a-fit-for-purpose-tobacco-and-nicotine-product-dependence-instrument>
- ✓ Chrea C., Salzberger T., Abetz-Webb L., et al. Development of a tobacco and nicotine products dependence instrument. Poster presentation at the Society for Research on Nicotine and Tobacco 24th Annual Meeting, Baltimore, USA (February, 2018).
<https://www.pmiscience.com/library/publication/development-of-a-tobacco-and-nicotine-products-dependence-instrument>
- ✓ Afolalu E., Chrea C., Salzberger T., Abetz-Webb L., Cano S., Weitkunat R., Rose J. (2019). Development and validation of the ABOUT™– Dependence instrument to assess perceived dependence on tobacco and nicotine products. Presented at the CORESTA SSPT 2019 Conference, Hamburg, Germany, 7th October 2019.
- ✓ Salzberger T., Cano S., Abetz-Webb L., Afolalu E., Chrea, C., Weitkunat R., Rose J. (under review). Addressing traceability of self-reported dependence measurement through the use of crosswalks
- ✓ Afolalu E., Chrea C., Abetz-Webb L., Salzberger T., Cano S., Rose J., Fagerström K. (under preparation) . Development and initial validation of a fit-for-purpose instrument to assess global dependence on tobacco and nicotine products



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Thank you for your interest and attention.

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