Updates from the Measures Development Workgroup: Introducing the HiTOP-SR and Discussion of Next Steps

Leonard J. Simms

University at Buffalo
The State University of New York

Meeting Agenda

- Re-tracing our steps: How we got here

- Introducing the HiTOP-SR

- Next steps for the measure and the workgroup

The Need for HiTOP-specific Measures

- We recognized early on that development of HiTOP measures would determine the ultimate impact of model.

- Without adequate measurement, the HiTOP model would risk being seen as an intellectually interesting yet practically useless exercise.

- In research, HiTOP-specific measures are needed to study all elements in the model, including the placement of new or provisional elements (e.g., somatoform, mania), as well as for theories of etiology and intervention.

- In the clinic, HiTOP-specific measures are needed to offer practicing clinicians a viable alternative to traditional classification methods (Ruggero et al., 2019).

How to Assess HiTOP?

- The consortium has worked along two independent routes to promote and develop HiTOP measures.

    - The **Clinical Translation Workgroup** has identified a set of HiTOP-*consistent* measures that can be used immediately (Ruggero et al., 2019).

    - The **Measures Development Workgroup** has been developing HiTOP-*specific* measures that (a) are specifically tied to the elements of the HiTOP structure, and (b) provide a means of testing that structure.

- External measures certainly exist for all domains within HiTOP; the primary goal was for a *unified* set of measures that spans the full breadth of the HiTOP model.
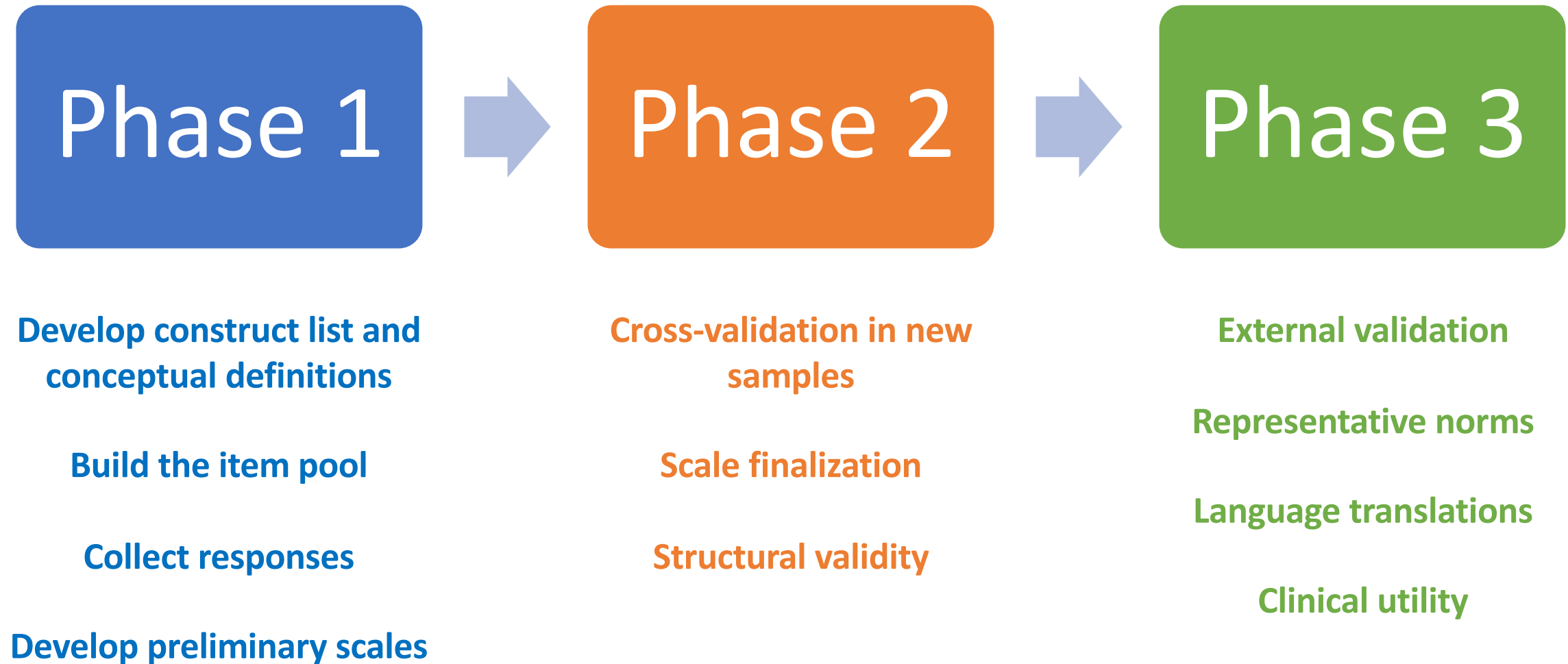
So we wanted to build a HiTOP measure, but we needed a framework to guide our collective work.

Jane Loevinger

- Loevinger (1957) was the first to systematically describe a theory-driven method of test construction firmly grounded in the concept of construct validity.

- We based our scale development procedures on Loevinger's principles of construct validity, especially as articulated by Clark & Watson (1995, 2019)

Phases of HiTOP Measure Development

Phase 1 → Phase 2 → Phase 3

Phase 1
- Develop construct list and conceptual definitions
- Build the item pool
- Collect responses
- Develop preliminary scales

Phase 2
- Cross-validation in new samples
- Scale finalization
- Structural validity

Phase 3
- External validation
- Representative norms
- Language translations
- Clinical utility

HiTOP Measures Development Workgroup

- The Measures Development Workgroup has included many members who have contributed in a wide variety of ways, including:
  - Suggesting and defining candidate constructs within HiTOP domains
  - Building item pools
  - Collecting data
  - Paying for data collection
  - Analyzing data
  - Reviewing and providing feedback on the measure
  - Helping with other measurement-related goals (e.g., interview, informant report, translations, etc.)

- Distributed labor model – lots of people have been involved…

Phase 1 Subgroups

Chair: Leonard Simms
Statistical Advisor: Aidan Wright

Thought Disorder
David Cicero (chair)
Roman Kotov
Katherine Jonas
Anna Docherty
Rachael Grazioplene
Avshalom Caspi
Mike Chmielewski
J.D. Haltigan
Uli Reininghaus
Elizabeth Martin
Vina Goghari

Somatic/Eating Pathology
Martin Sellbom (chair)
David Watson
Kelsie Forbush
Kristian Markon
Michael Witthöft
Sara Gould

Externalizing
Stehpanie Mullins-Sweatt (chair)
Donald Lynam
Joshua D Miller
Jennifer L. Tackett
Lee Anna Clark
Marina Bornovalova
Doug Samuel
Giorgia Michelini
Katherine M. Keyes
Katherine Jonas
Natacha Carragher
Noah Venables
Ashley Watts
Kasey Stanton
Molly Nikolas
Craig Rodriguez-Seijas

Internalizing
David Watson (chair)
Mike Bagby
Tim Brown
Miri Forbes
Kristin Gainey
Shereen Khoo
Yuliya Kotelnikova
Roman Kotov
Holly Levin-Aspenson
Camilo Ruggero
Kasey Stanton
Matt Sunderland

Detachment
Tom Widiger (co-chair)
Johannes Zimmermann (co-chair)
Les Morey
Chris Conway

Phase 2 Analytic Team

Analytic Team

Marina Bornovalova

Miri Forbes

Ashley Greene

Holly Levin-Aspenson

Kristian Markon

Stephanie Mullins-Sweatt

Doug Samuel

Martin Sellbom

Kasey Stanton

David Preece

David Watson

Ashley Watts

Johannes Zimmermann

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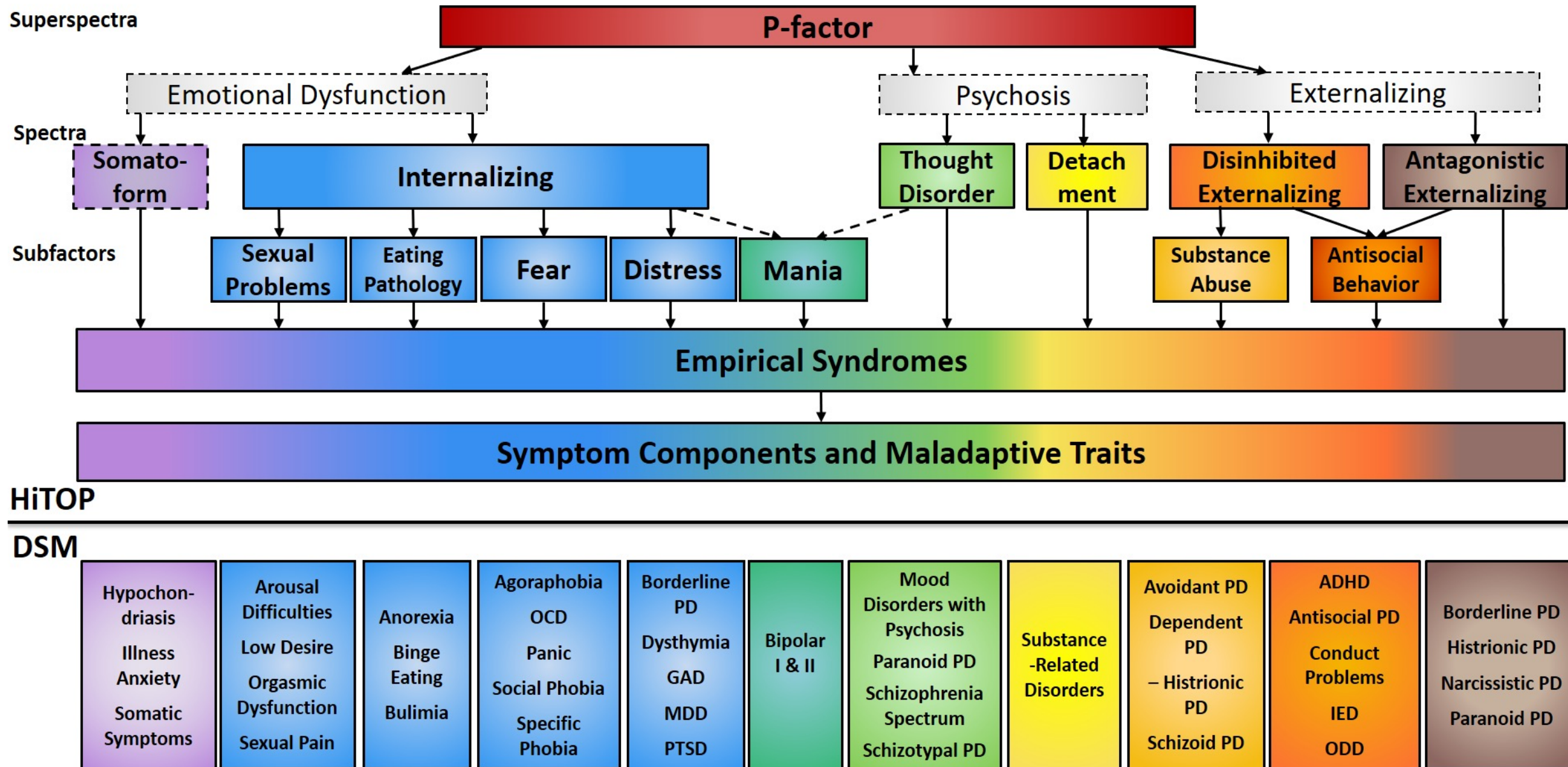
Data Cleaning: Courtney O'Keefe

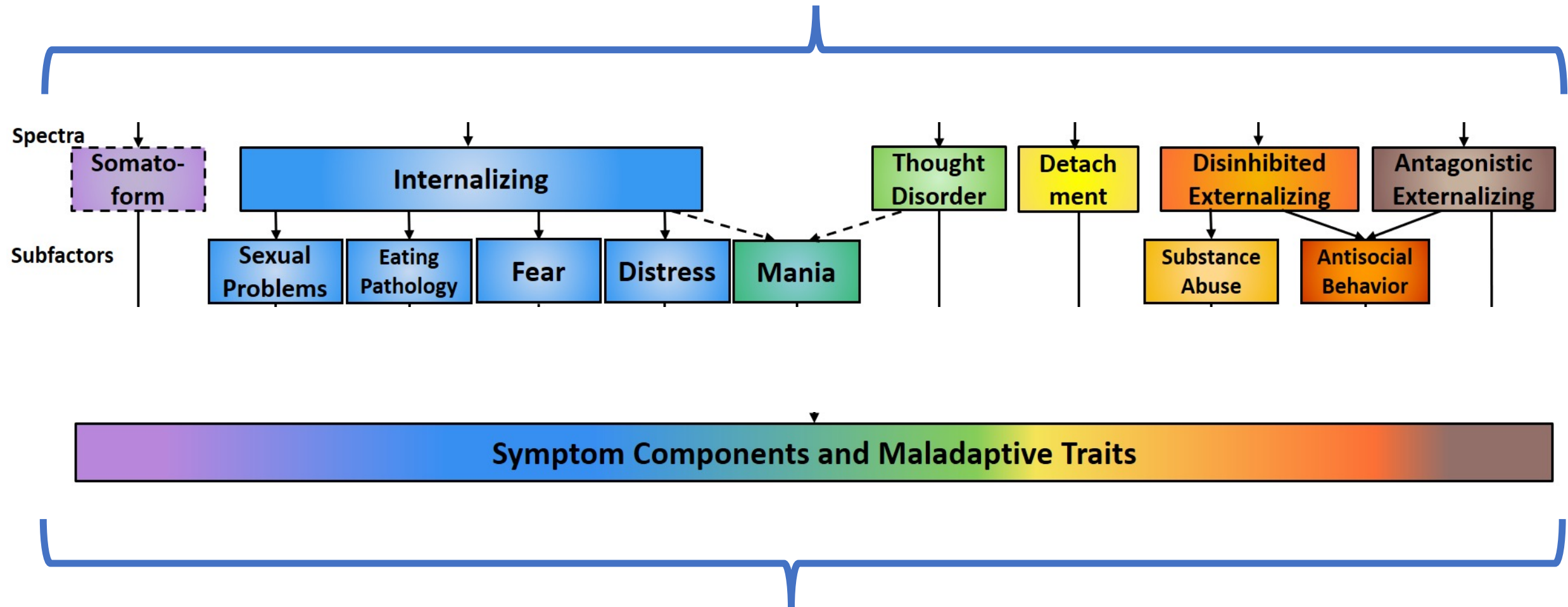**Data Diagnostics:** Roman Kotov

Previous Subgroup Chairs

Tom Widiger

David Cicero

Brief summary of Phase 1 methods and results

Kotov et al., 2021

Measurement Subgroups were organized top-down by spectra and subfactors

Spectra

Subfactors

Somato-form

Internalizing

Sexual Problems | Eating Pathology | Fear | Distress | Mania

Thought Disorder

Detachment

Disinhibited Externalizing

Antagonistic Externalizing

Substance Abuse | Antisocial Behavior

Symptom Components and Maladaptive Traits

Measure development proceeded bottom-up at the level of symptom components and maladaptive traits

Phase 1 Summary

- The Measures Development Workgroup members were organized into five psychopathology spectrum-based subgroups:
    - **internalizing psychopathology**
    - **disinhibited and antagonistic externalizing psychopathology**
    - **thought disorder**
    - **detachment**
    - **somatization and eating pathology**

- These subgroups identified an exhaustive set of candidate constructs, defined them, and built item pools relevant to their domains.

- Each group collected their own data but followed a centralized data analytic plan to develop candidate scales to push into Phase 2 data collection.

Phase 1 Summary: Other Decisions

- We opted for a 4-point degree-based response format: **not at all, a little, moderately, and a lot**.

- We opted for a **past-year timeframe**.

- We opted to write items to reflect a broad range of psychopathology content, including signs, symptoms, features, and traits.

- Instructions:

  "In this survey, you will be asked to respond to a number of statements about your thoughts, feelings, and behavior. Some of these things are pretty common, whereas others are less common. As you complete the survey, please consider whether there have been significant times during the last 12 months during which the following statements applied to you. Then please select the option that best describes how well each statement described you during that period: 0 = not at all; 1 = a little; 2 = moderately; 3 = a lot"

Contents

Summary of Construct and Item Development

Phase 1:
Initial pool
181 constructs
2,184 items

Data collection and structural analyses *within* each Subgroup

Into Phase 2:
142 constructs
1,185 items

Phase 2 data collections

- Goals: Cross-validation and scale finalization.

- Phase 2 data collection took place across a number of patient, community, crowd-sourced (Prolific), and student samples.

- Given the large number of Phase 2 constructs and items:

  - Various amounts of **planned missingness** across samples.

  - So item-level analyses were conducted using a pairwise-present strategy, on matrices of **polychoric correlations** among items.

- Total clean N = 4,079 for non-SUD items.

- Separate Phase 2 data collection for SUD items, N = 1,424.

Phase 2 Samples
(Total clean *N* = 4,079)

Sample	*N*	Aggregate *N*s
Buffalo Patients	269	
Stony Brook Patients	320	**869**
University of North Texas Patients	280	
Buffalo Prolific Patients	640	
Notre Dame Prolific Patients	625	**1,265**
Buffalo Students	528	
UC Irvine Students	253	
Notre Dame Students	450	**1,308**
Indiana University Students	77	
Preece Mturk	133	**133**
University of North Texas Prolific Community	504	**504**

Phase 2 Samples

Age	*M* = 31.3; *SD* = 14.6
Sex	62% female
Gender	2.6% non-binary
Sexual Orientation	79% heterosexual, 5% gay/lesbian, 13% bisexual
Race	74% White, 9% Black, 9% Asian, 4% Pacific Islander, 2% Native American
Ethnicity	11% Hispanic/Latinx
Hx of Psychiatric Tx	60% yes
Current Psychiatric Tx	34% yes

Phase 2 Samples – Substance Use Module

(Total clean *N* = 1,424)

Sample	*N*	Aggregate *N*s
Buffalo Patients	168	
Stony Brook Patients	243	**879**
University of North Texas Patients	468	
Prolific Patients	545	**545**

Phase 2 Samples – Substance Use Module

Age	*M* = 40.9; *SD* = 14.9
Sex	61% female
Gender	2.2% non-binary
Sexual Orientation	77% heterosexual, 5% gay/lesbian, 14% bisexual
Race	83% White, 6% Black, 3% Asian, 2% Native American
Ethnicity	7.4% Hispanic/Latinx
Hx of Psychiatric Tx	66% yes
Current Psychiatric Tx	39% yes

Phase 2 Scale Development Analytic Strategy

Prelim Scale 1				
Prelim Scale 2	Factor Analysis of Prelim Scales →	Scale Group A	Factor Analysis of Items **within** groups →	Candidate Scale 1
Prelim Scale 3		Scale Group B		Candidate Scale 2
⋮				Candidate Scale 3
Prelim Scale *k*				Candidate Scale *k*
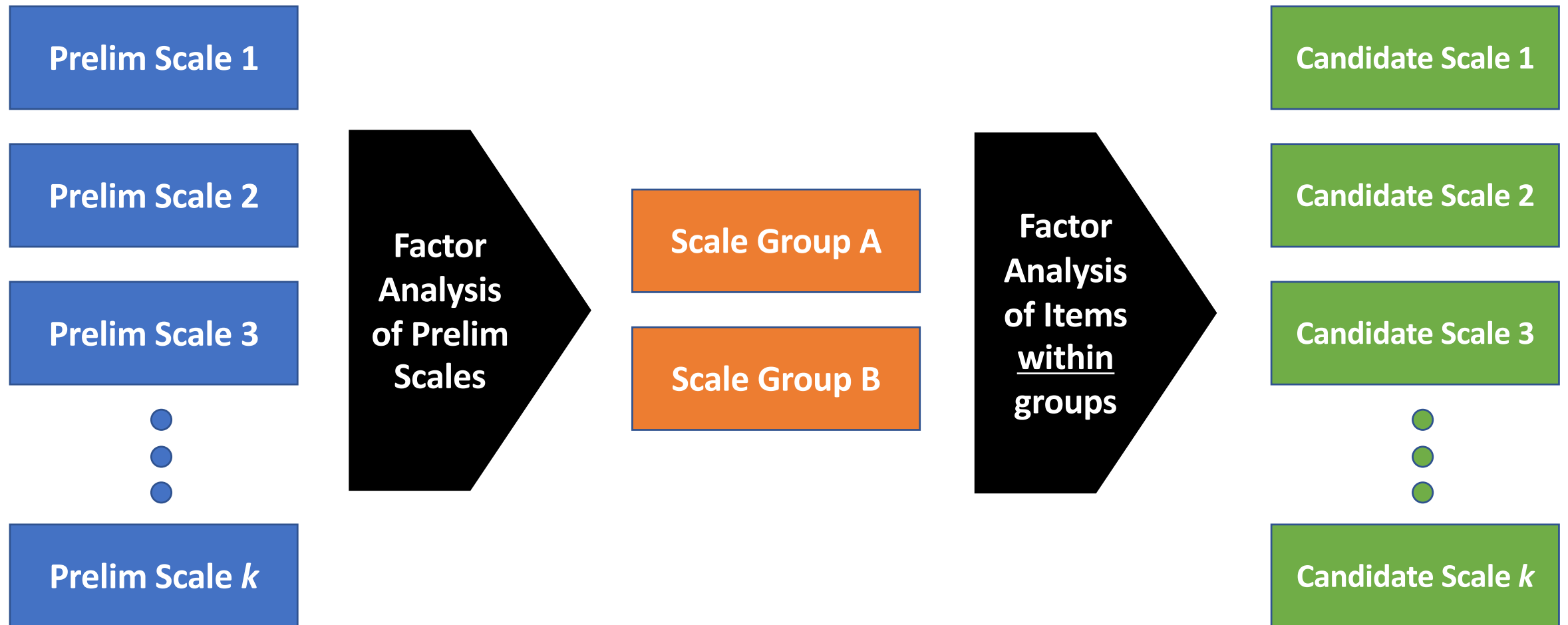
Phase 2 Scale Development Analytic Strategy

Trimming and finalizing scales:

Content validity, internal consistency, factor structure, IRT information curves, and interstitial issues.   Feedback from team. Iterate as needed.

Scale 1

Scale 2

Scale 3

Scale _k_

Results Summary

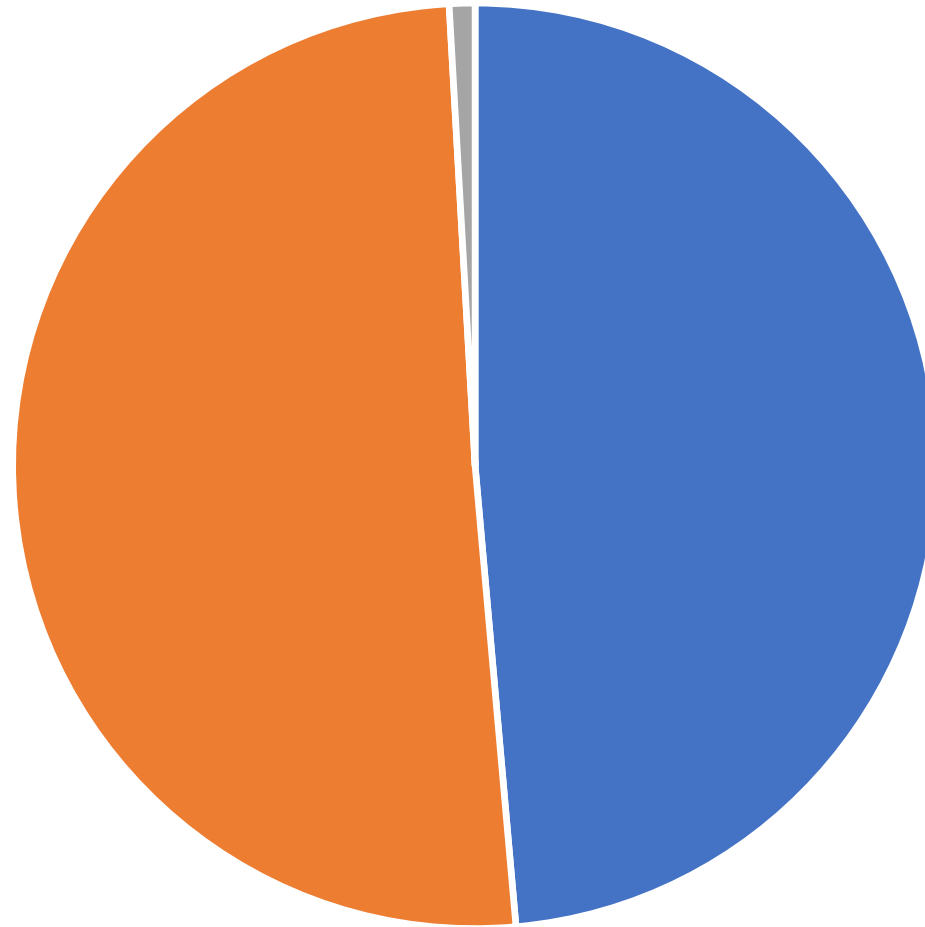- The process outlined above and feedback from the analytic teams resulted in an experimental version of the measure (HiTOP-SR-EXP) with **some new items** added to address the feedback.

- We collected additional data on the HiTOP-SR-EXP in a clean sample of **780 Prolific participants** who were stratified with respect to biological sex and age.

Biological Sex

- Male
- Female
- Prefer not to say

Race/Ethnicity

- White
- Back
- Hispanic/Latinx
- Asian
- Native American
- Other
- Multiple

Simple Histogram of Age

Mean = 44.4167
Std. Dev. = 14.90335
N = 780
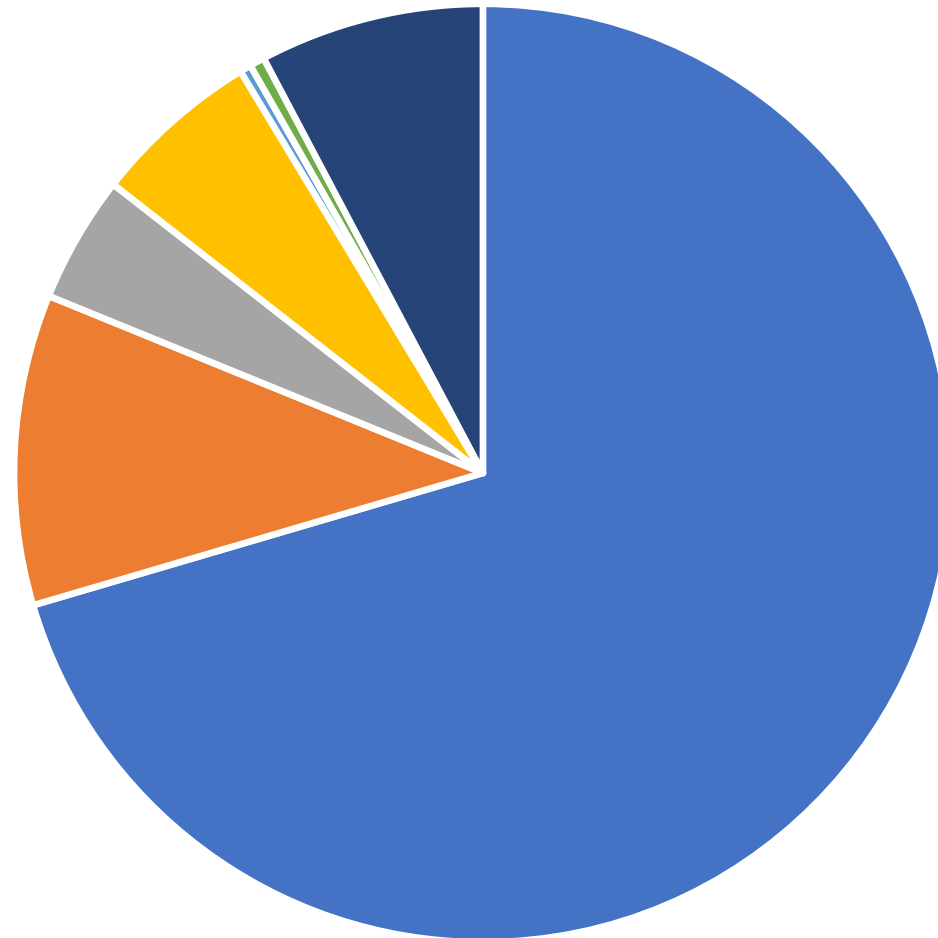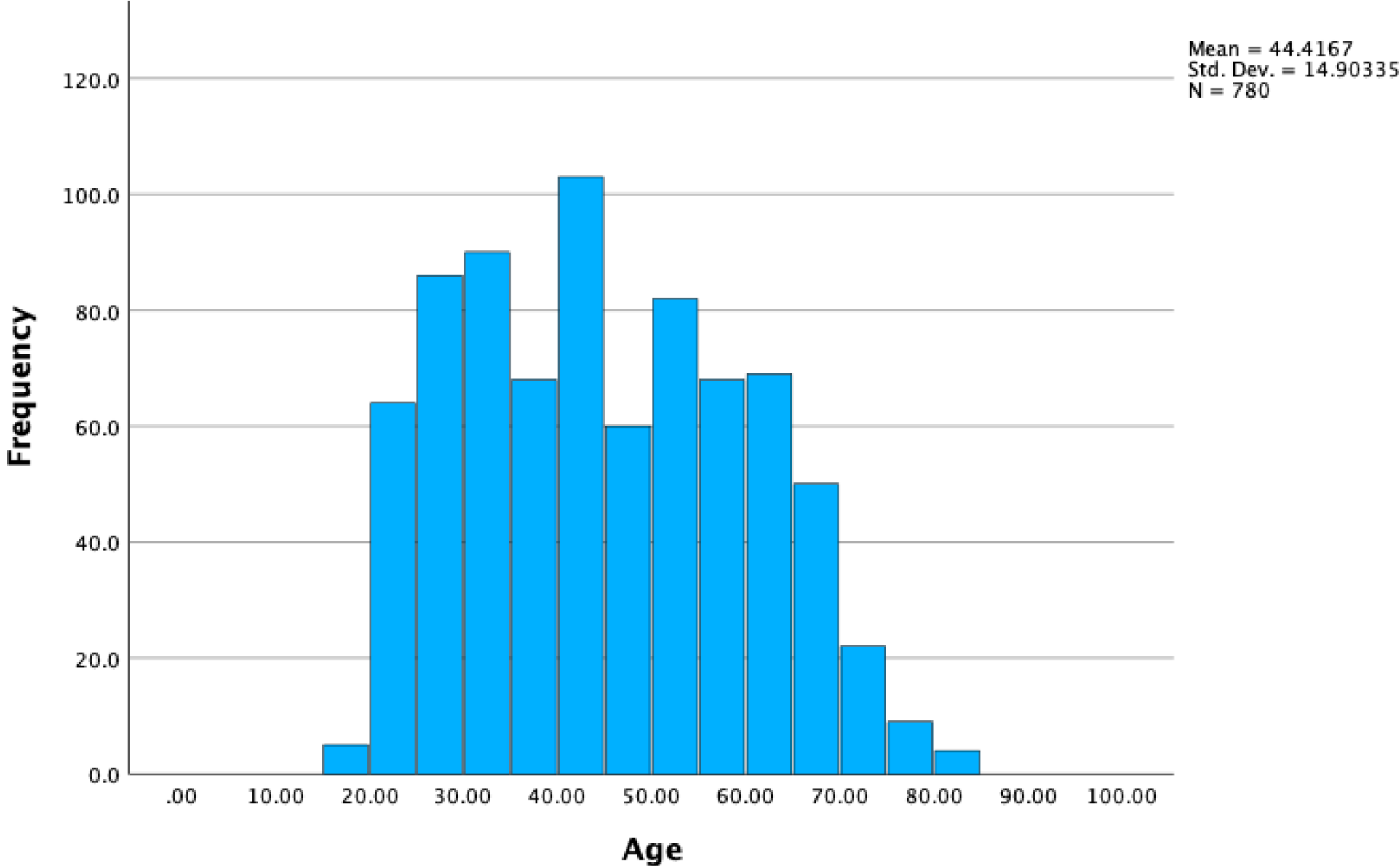
Education Level

- Completed Elementary School
- Completed High School/Received GED
- Some College/University Education
- Associate's Degree or Technical Certification
- Bachelor's Degree
- Some Graduate Education
- Completed Graduate Degree
- Prefer not to say
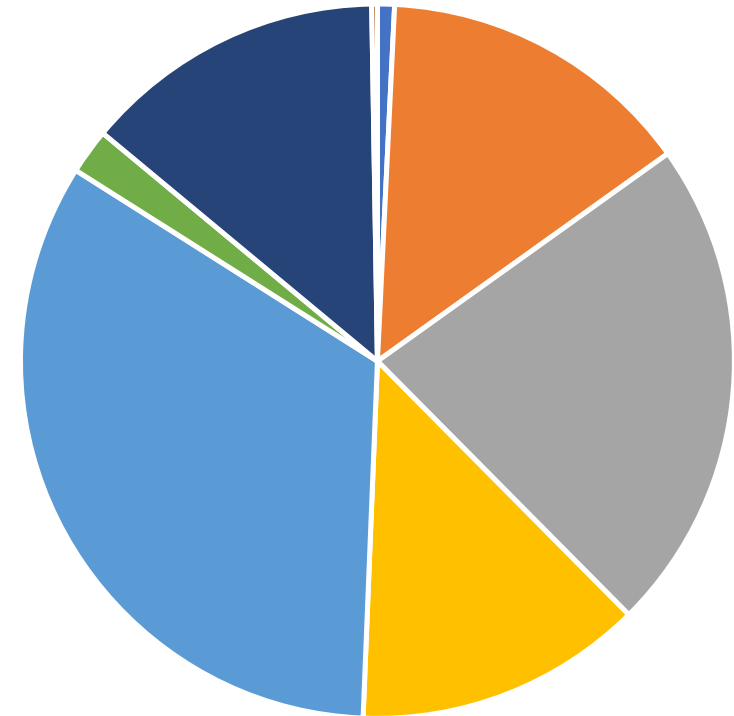
Have you seen a physician, psychologist, therapist, social worker, or counselor for a mental health concern?

Finalizing the Scales…

Scale 1

Scale 2

Scale 3

•
•
•

Scale *k*

- Experimental items added
- Prolific data collection
- Final scale honing based on content validity, internal consistency, factor structure, IRT information curves, and interstitial issues.

Final Scale 1

Finsl Scale 2

Final Scale 3

•
•
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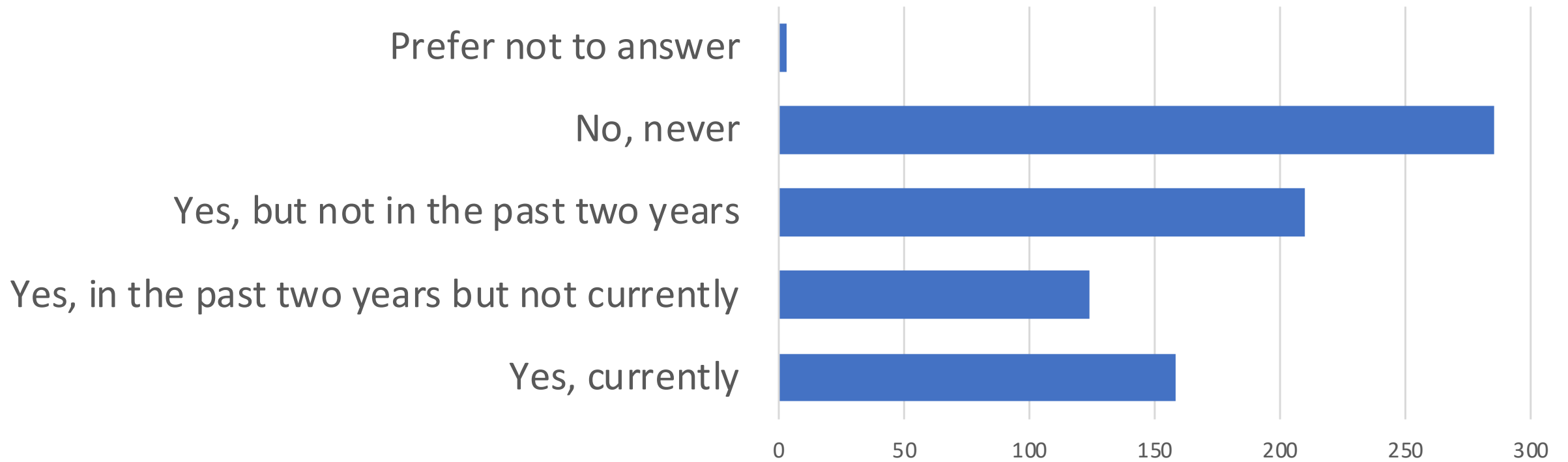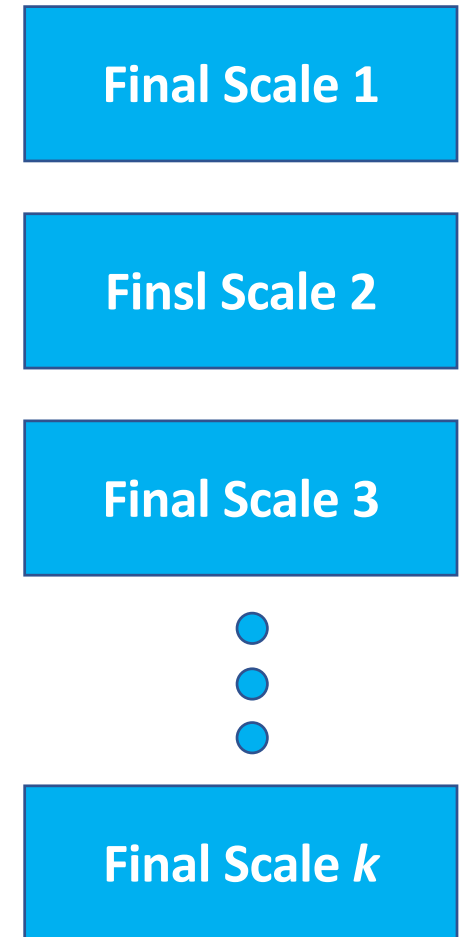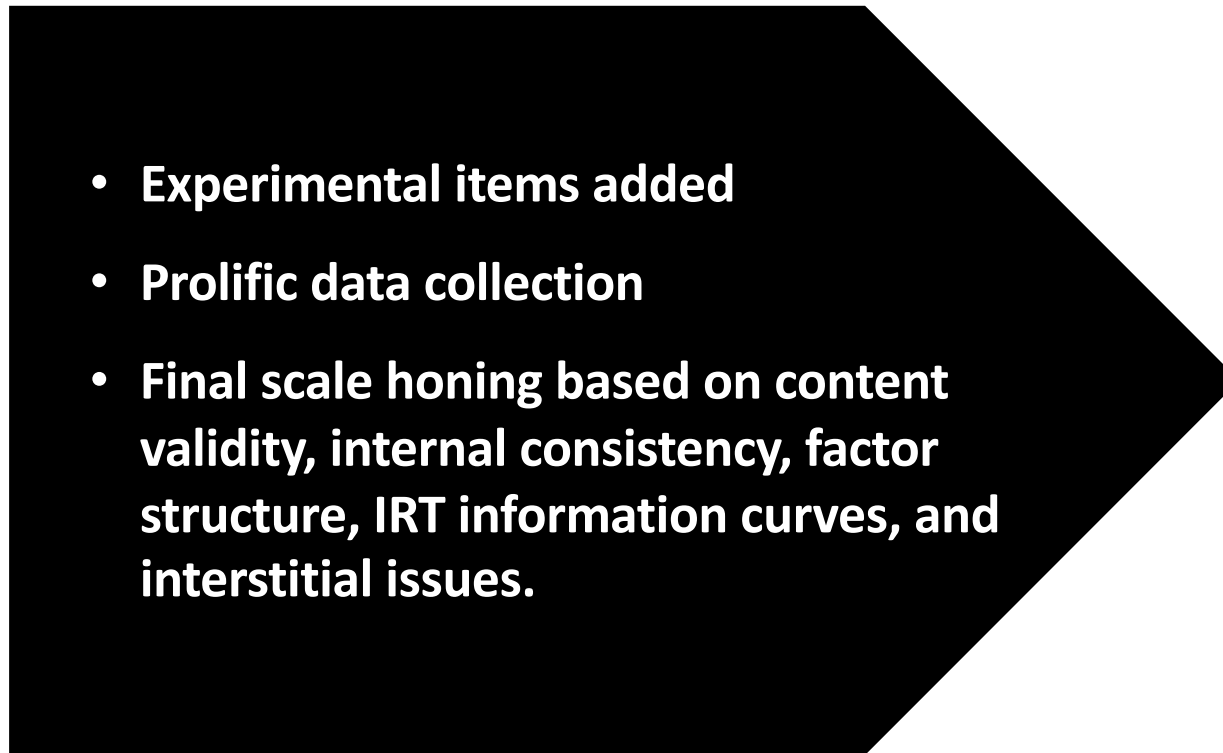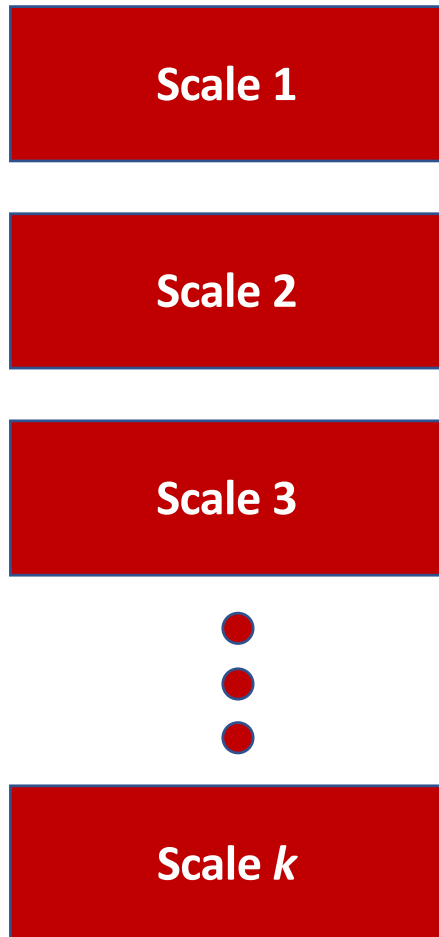
Final Scale *k*

HiTOP-SR-EXP Study: Base Measure Results

	Total	Subscales
# of items	405	66
# of scales/subscales*	76	17
M items/scale	5.3	3.9

* 87 unique scales and subscales

\# Plus an SUD module with 6 additional scales, assessing up to 3 substances, which is pending final analyses.

HiTOP-SR Scales and Subscales

- The idea that all facets of psychopathology reflect the same level of specificity or generality undoubtedly is wrong.
- Thus, we developed subscales in some specific situations.
  - Subscales were developed both for rational and empirical reasons.
  - **Empirical subscales**: When factoring within scale revealed meaningful but highly correlated factors.
  - **Rational subscales**: When conceptual or practical considerations warranted subscales so that important content was not lost (e.g., depressed mood, anxious worry).
- Here are the scales and subscales, organized **rationally** with respect to the HiTOP model…
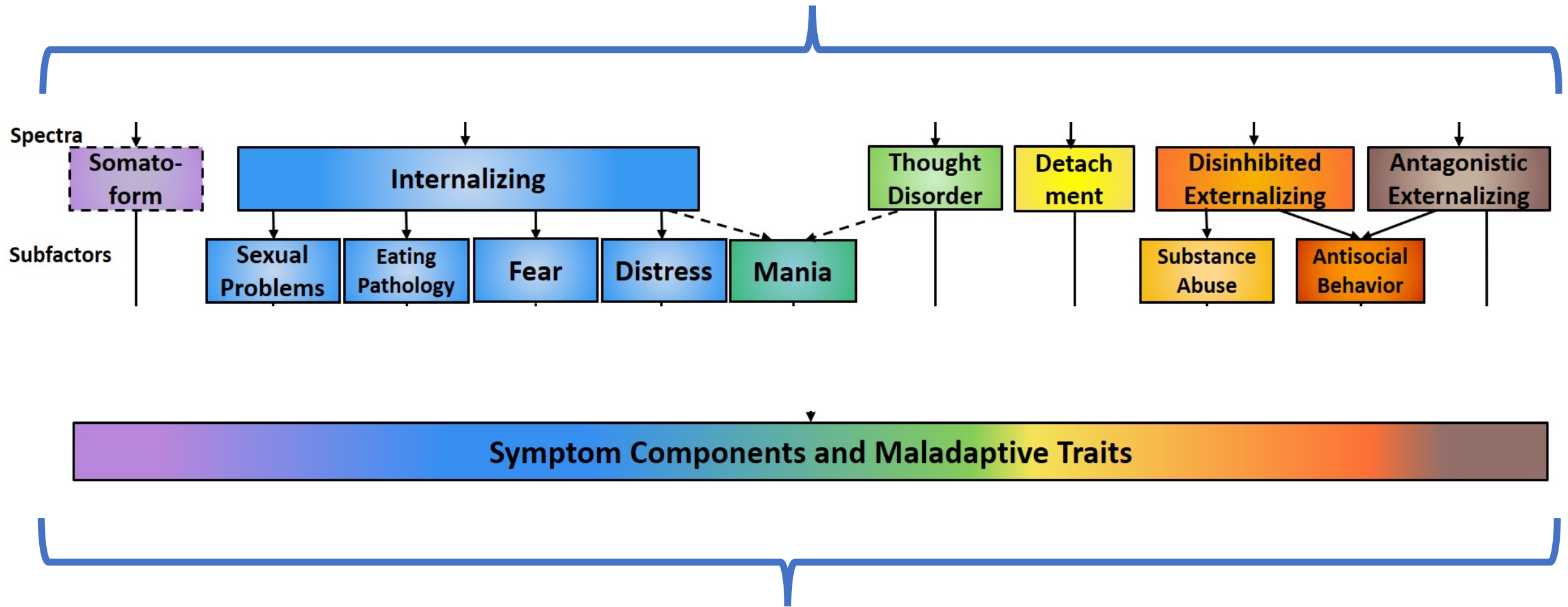
Somatoform Scales

HiTOP-SR Scale	# Items	alpha
Health Anxiety	4	0.87
Somatic Preoccupation	5	0.84
Conversion Symptoms	7	0.82
Disease Conviction	4	0.87
Bodily Distress	6	0.85

Internalizing : Distress Scales

HiTOP-SR Scale	# Items	alpha
Cognitive Problems	5	0.88
Distress-Dysphoria	16	0.96
Anhedonia	3	0.88
Anxious Worry	3	0.90
Depressed Mood	4	0.92
Lassitude	3	0.87
Shame/Guilt	3	0.88
Emotionality	11	0.93
Affective Lability	3	0.81
Angry Hostility	4	0.84
Irritability	4	0.90
Insomnia	4	0.89
Nightmares	3	0.86
Non-suicidal Self-Injury (NSSI)	6	0.83
Suicidality	4	0.74

Internalizing : Fear Scales

HiTOP-SR Scale	# Items	alpha
Agoraphobia	5	0.86
Checking	5	0.88
Cleaning	6	0.82
Counting	5	0.81
Excoriation	3	0.86
Hoarding	6	0.83
Hypervigilance	6	0.85
Panic	5	0.84
Specific Phobia Index	12	0.82
Animal-Insect Phobia	*5*	*0.76*
Blood-Injection Phobia	*3*	*0.66*
Situational Phobias	*4*	*0.61*
Trauma Reactions	5	0.88
Trichotillomania	3	0.67

Internalizing : Eating Pathology Scales

HiTOP-SR Scale	# Items	alpha
Appetite Loss	3	0.80
Binge Eating	3	0.83
Body Dissatisfaction	4	0.88
Body Focus	5	0.81
Dietary Restraint	5	0.81
Excessive Exercise	5	0.83
Food Selectivity	4	0.80
Muscle Building	5	0.84
Purging	3	0.66
Restricted Eating	4	0.81

Internalizing : Sexual Problem Scales

HiTOP-SR Scale	# Items	alpha
Difficulties Reaching Orgasm	3	0.84
Low Sexual Arousal	3	0.86
Low Sexual Interest	3	0.83
Paraphilias	5	0.75
Premature Orgasm	4	0.76
Risky Sex	4	0.72
Sex-Related Substance Use	4	0.74
Sexual Distress	4	0.87
Sexual Pain	3	0.85

Internalizing – Thought Disorder : Mania

HiTOP-SR Scale	# Items	alpha
Manic Energy	7	0.82

Detachment Scales

HiTOP-SR Scale	# Items	alpha
Restricted Affectivity	5	.84
Romantic Disinterest	5	.87
Social Aloofness	5	.88
Social Anxiety	5	.88
Submissiveness	4	.88
Well-being	5	.88

Thought Disorder Scales

HiTOP-SR Scale	# Items	alpha
Dissociation	6	0.86
Eccentricity	5	0.84
Fantasy Proneness	6	0.84
Mistrust	8	0.85
Cynicism	4	0.85
Suspiciousness	4	0.80
Reality Distortion	11	0.87
Delusions	5	0.74
Hallucinations	6	0.80

Externalizing : Antagonism Scales

HiTOP-SR Scale	# Items	alpha
Callousness	6	0.84
Dishonesty	8	0.87
Deceitfulness	*4*	*0.85*
Manipulativeness	*4*	*0.83*
Domineering	6	0.84
Entitlement	6	0.72
Exhibitionism	5	0.86
Grandiosity	6	0.79
Social Aggression	6	0.80

Externalizing : Disinhibition Scales

HiTOP-SR Scale	# Items	alpha
Disorganization	7	0.84
Gambling	5	0.86
Gaming	4	0.79
Non-persistence	5	0.86
Non-planfulness	5	0.88
Problematic Shopping	4	0.84
Restlessness	5	0.84
Risk Taking	4	0.86

Externalizing : Anankastia Scales

HiTOP-SR Scale	# Items	alpha
Hyperdeliberation	6	0.82
Perfectionism	5	0.85
Rigidity	5	0.76
Risk Aversion	6	0.85
Workaholism	5	0.78

Externalizing : Harmful Substance Use Scales*

*scales are pending final analyses*

HiTOP-SR Scale	# Items	alpha
Craving		
Hazardous Use		
Impaired Control		
Role Interference		
Tolerance		
Withdrawal		
Frequency items		

* HSU scales are structured as a separate module that can assess up to three substances using each of the above scales.
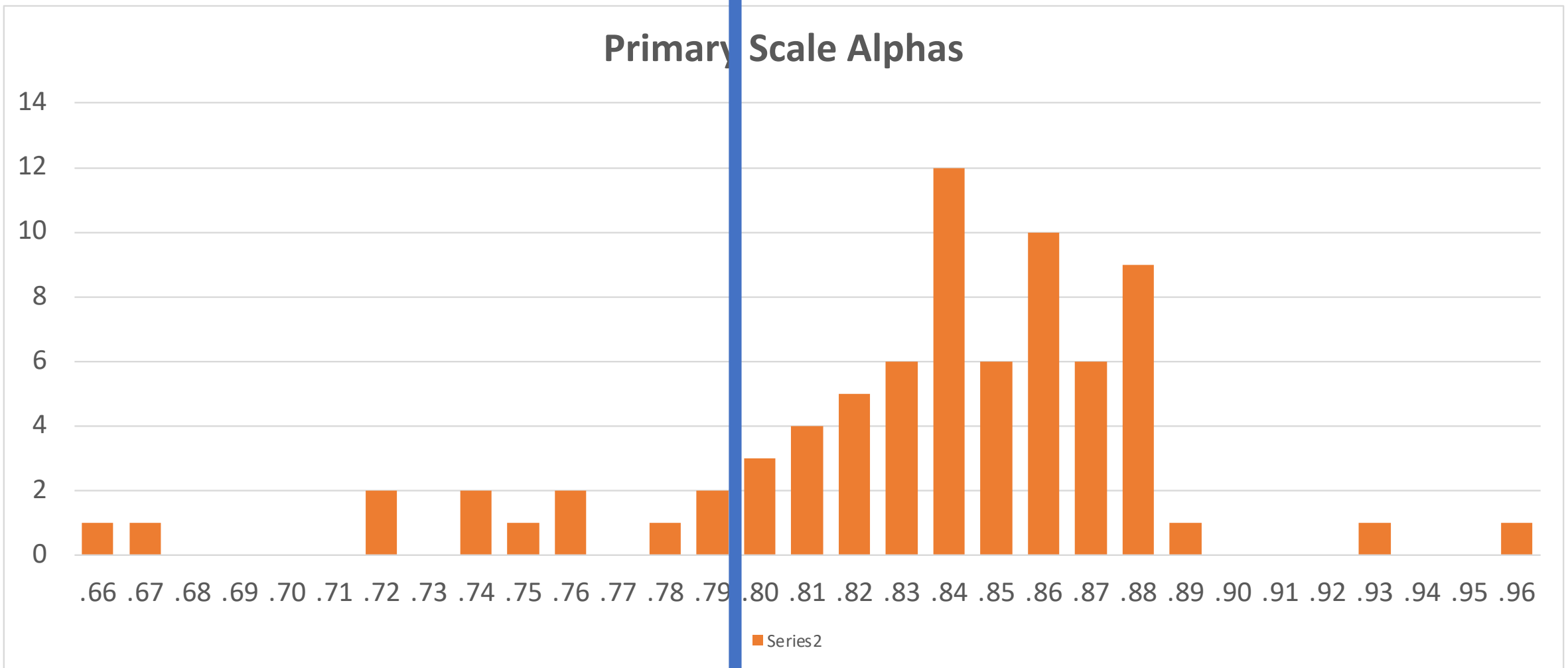
Externalizing : Antisocial Scales

HiTOP-SR Scale	# Items	alpha
Antisocial Behavior	8	0.86
Oppositionality	6	0.83

Primary Scale Lengths
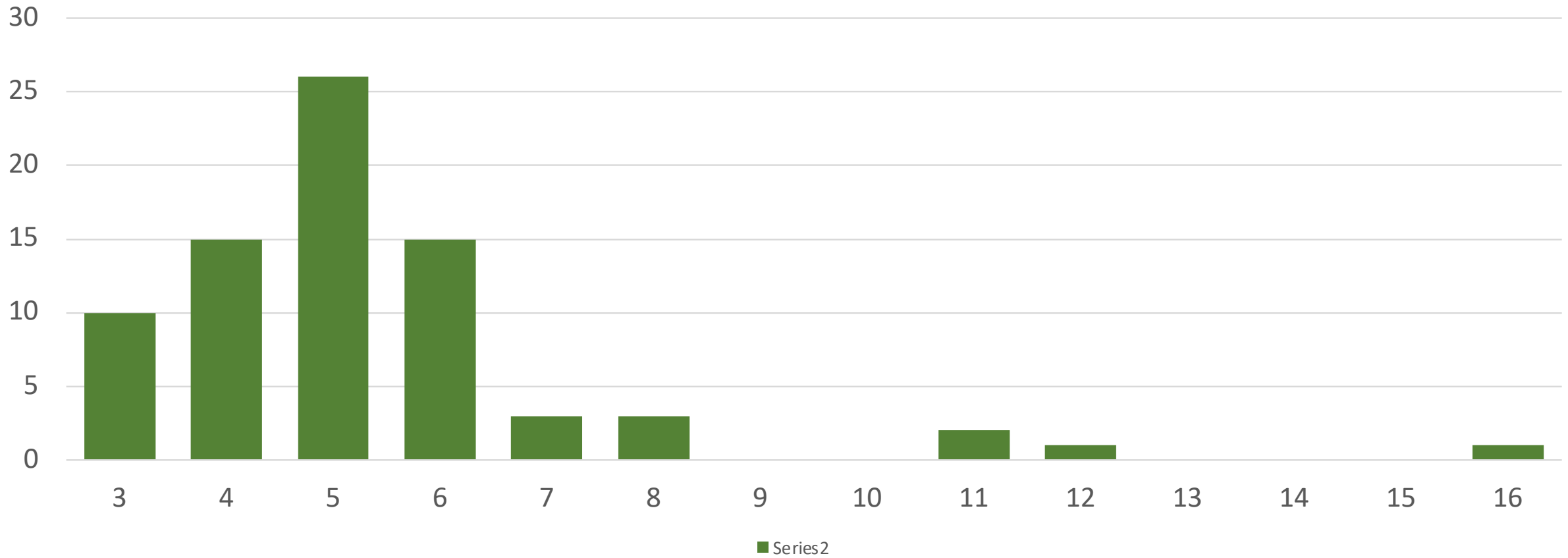
Primary Scale Alphas

M alpha = .83

Structure of These Scales?

- Kristian Markon is taking the lead on structural analyses.
- Short answer: **It's messy and a work in progress**.
- Issues contributing to the messiness:
  - Lots of scales, and subscales nested within some scales
  - Lots on interstitiality
  - Lack of ideal sampling for some scales, resulting in high skew for lower base rate phenomena – which is resulting in one heterogeneous "difficulty" factor that lacks a clear substantive meaning.
  - Lots of planned missingness in the composite sample – which makes it difficult to score the scales.
- So we are iterating. And new samples ultimately will be needed.

Other Things We're Doing (or will be doing)

- Finishing the **Harmful Substance Use module** – soon.

- Studying potential item- and scale-level **biases** as a function of ethnicity, gender, and other important demographics.

- **Interview development**: Roman Kotov is leading this process.

- **Informant form** of the measure.

- **Language translations**: Lots of inquiries. Some started. Camilo Ruggero is leading the language translations workgroup.

- **External validation** against other measures and relevant criteria.

- Representative **norms**

Other Things We're Doing (or will be doing)

- **Short forms** and modularization

- Building standardized **Qualtrics and RedCap modules** that can be shared with researchers wishing to use some or all of the measure in their studies.

- Impairment scale

- Youth/adolescent version

- Validity scales

- Critical items

- Dissemination efforts

HiTOP-SR Conclusions

- We have a **Research-Ready** Base HiTOP-SR ready to go. Will be posted on the web soon, along with these slides and this presentation.

- **HSU module** should be complete soon and also will be posted.

- **Clinic-Ready** version to follow later, pending validation and clinical utility work.

- Publication(s) of the measure will come in 2024.

- All measures are free to use, open-source, and available online. All data will be made available via an open science platform.

- The measures should be helpful in improving the **clinical and research utility** of the HiTOP model.

Re-imagining Measures Development Workgroup

- The Measures Development Workgroup is large, and many members have been relatively inactive in the past couple years as the work has focused on smaller groups of analysts to help get the measure to its current state.

- Moving forward, we need to re-imagine the way the workgroup is structured.

- We are conducting an **opt-in survey** is to:

    - gauge interest in joining (or remaining in) the workgroup.

    - collect information to better assign members to new workgroups focused on specific projects that are needed to study and disseminate the measure.

- Notably, I also am soliciting names to be considered for a **co-chair** role in the workgroup.

Workgroup Membership Opt-in Survey

- If you wish to stay in or join the Measures Development Workgroup, please complete the **opt-in survey**.

- You'll have an opportunity to specify the projects you might wish to get involved in.

- An option also exists to join as a passive "interest group" member.

- Leadership opportunities are available.

https://buffalocas.co1.qualtrics.com/jfe/form/SV_4PA4YzCcNhaPH26

Final Thoughts

Hey man of science with your perfect rules of measure
Can you improve this place
with the data that you gather?

Gurewitz & Graffin (1989)

All measures are wrong, but some are useful. The HiTOP measures will be no different.

Our goal remains a measure that offers a healthy balance of usefulness relative to wrongness.

We've done a lot. But there is more to do. Please complete the opt-in survey if you have an interest in helping with any of the initiatives that we have planned.

Acknowledgements

Aidan Wright
Anna Docherty
Ashley Greene
Ashley Watts
Asif Zaarur
Avshalom Caspi
Brady Nelson
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Vina Goghari
Yuliya Kotelnikova

Q&A

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ljsimms@buffalo.edu