Health literacy is associated with patients' adherence-related knowledge and motivation, but not adherence or clinical outcomes

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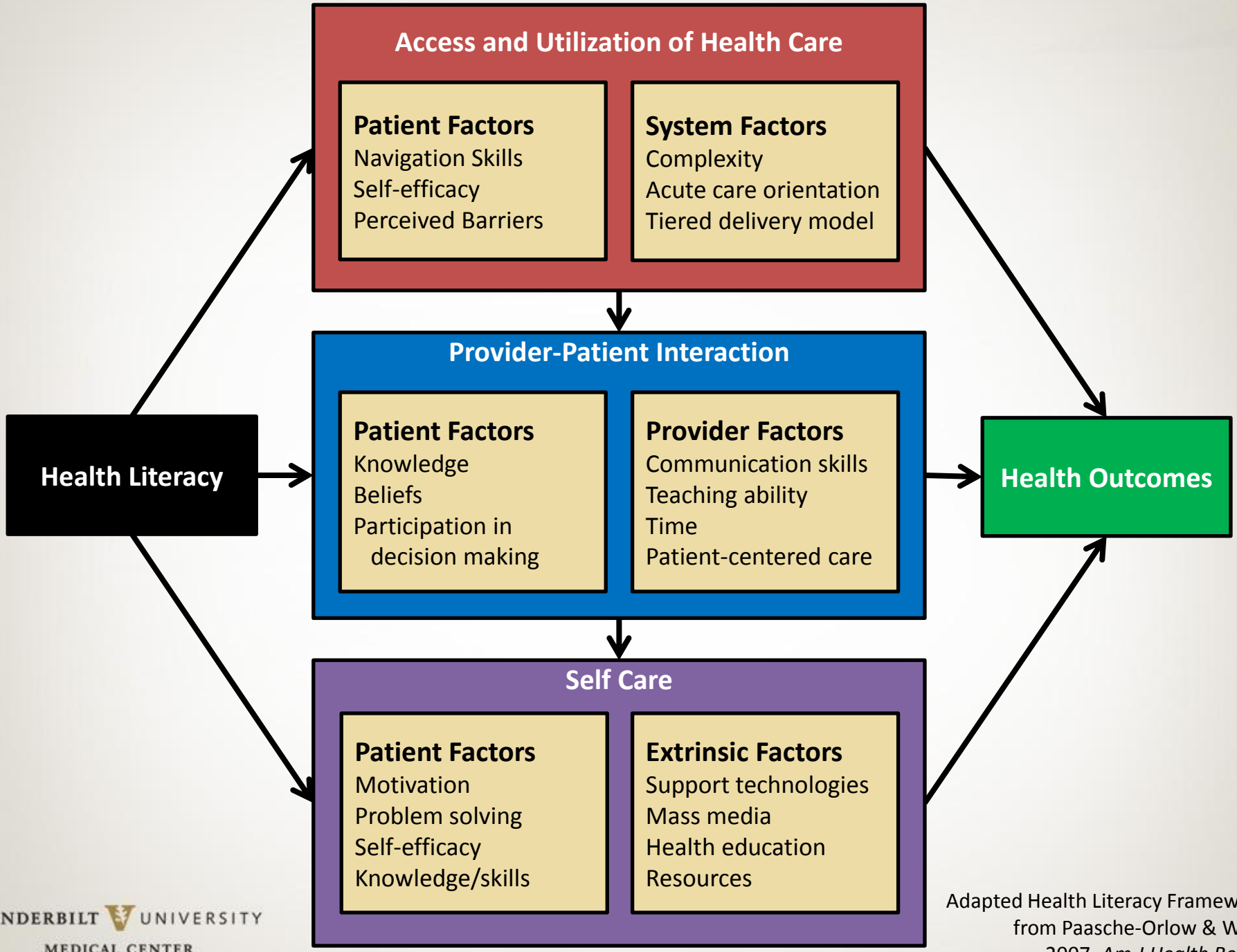
Research Staff:

- Cecilia Quintero, BA

Background

- The exact mechanisms by which health literacy influences health behaviors and clinical outcomes are unclear.[1]
- Theoretical frameworks have suggested possible pathways.[2,3]
  - Paasche-Orlow & Wolf, 2007
  - von Wagner et al., 2009

[1]Osborn et al., 2011, *Am J Health Behav*
[2]Paasche-Orlow & Wolf, 2007, *Am J Health Behav*
[3]von Wagner et al., 2009, *Health Educ Behav*



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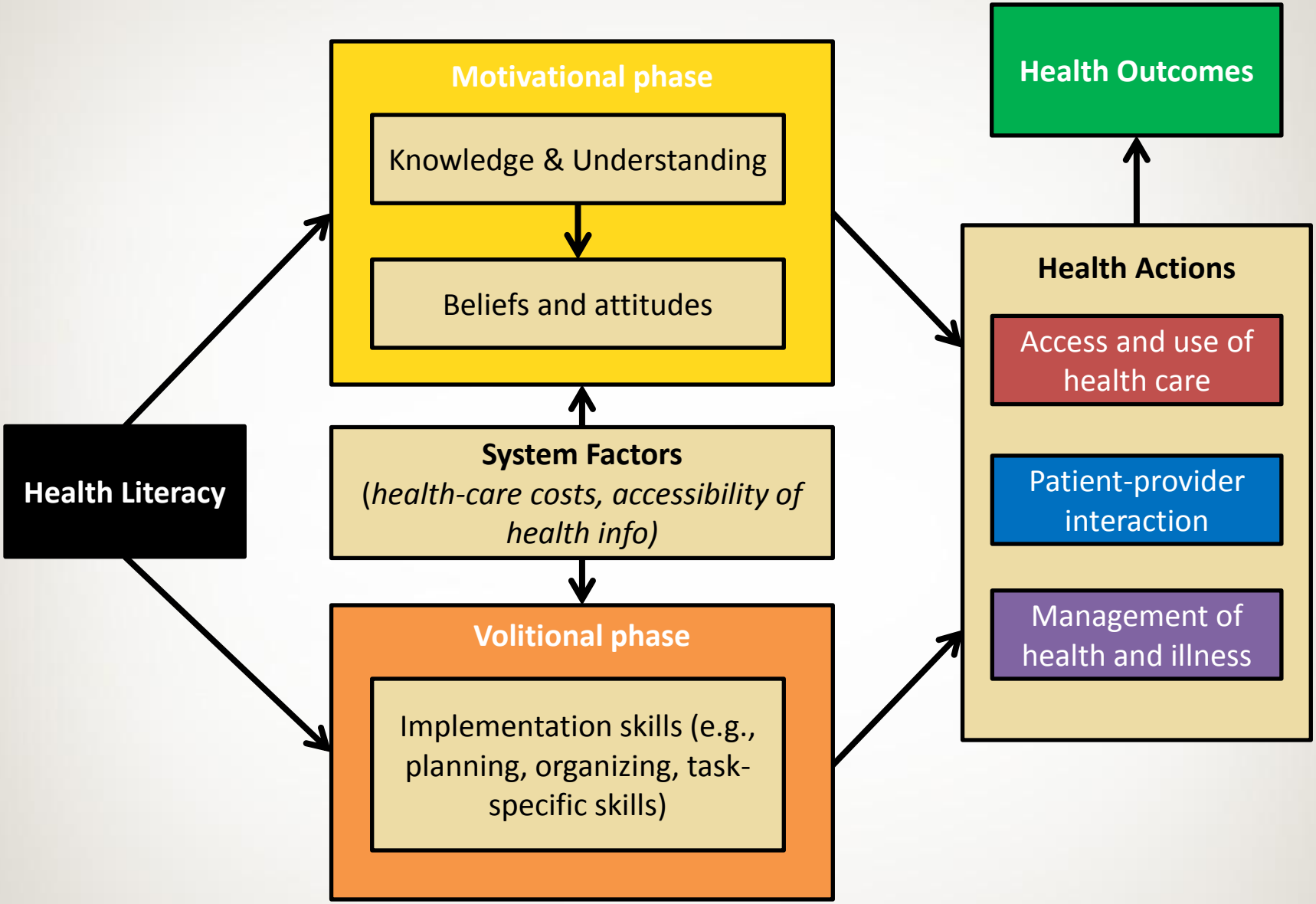
Adapted Health Literacy Framework from Paasche-Orlow & Wolf, 2007, *Am J Health Behav*



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Adapted Health Literacy Framework from von Wagner et al., 2009, *Health Educ Behav*

Background

- The exact mechanisms by which health literacy influences health behaviors and clinical outcomes are unclear.[1]
- Theoretical frameworks have suggested possible pathways.[2,3]
  - Paasche-Orlow & Wolf, 2007
  - von Wagner et al., 2009
- **However, empirical support for these frameworks has been limited.**

[1]Osborn et al., 2011, *Am J Health Behav*
[2]Paasche-Orlow & Wolf, 2007, *Am J Health Behav*
[3]von Wagner et al., 2009, *Health Educ Behav*

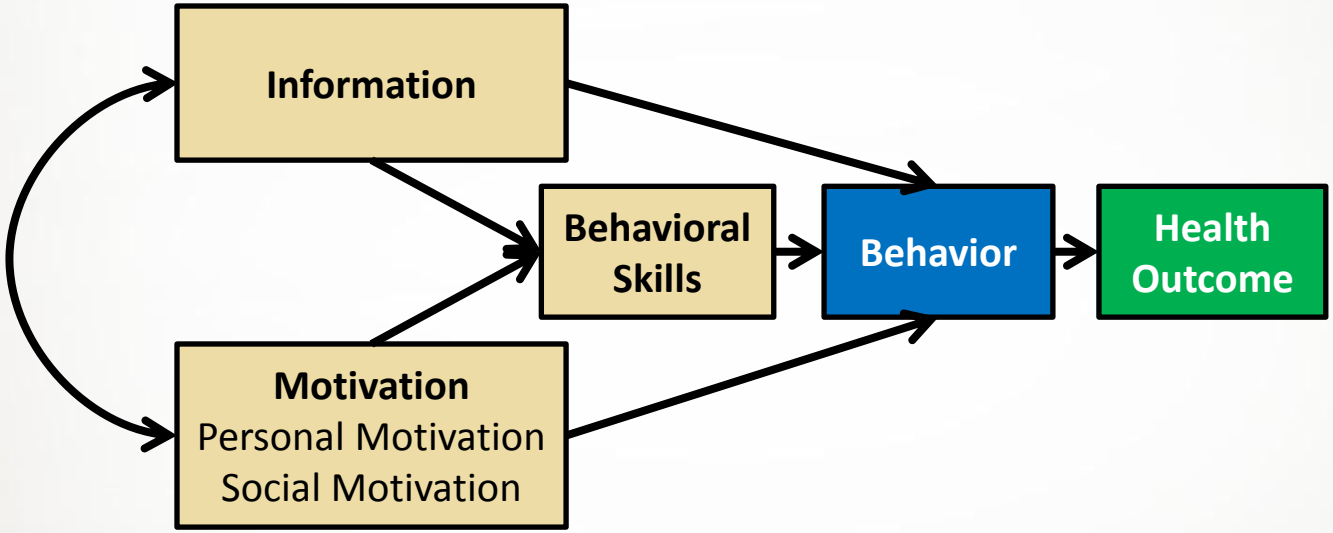
Background

- In diabetes, there has been mixed evidence linking limited health literacy to suboptimal self-care and glycemic control (A1c).
  - Limited health literacy has been inconsistently associated with less adherence to self-care behaviors.[1,2]
  - Limited health literacy has been inconsistently associated with worse glycemic control.[3]
- Health literacy may be more strongly related to factors that determine health behaviors and, in turn, clinical outcomes than to either of these endpoints.

[1]Fransen, von Wagner, & Essink-Bot, 2012, *J Gen Intern Med*
[2]Loke et al., 2012, *Ann Pharmacother*
[3]Al Sayah et al., 2013, *J Gen Intern Med*

Background

- The Information-Motivation-Behavioral Skills (IMB) model predicts adherence to diabetes medications and glycemic control.[1]



- Limited evidence suggests health literacy impacts self-care through behavior-related information and motivation.[2,3]

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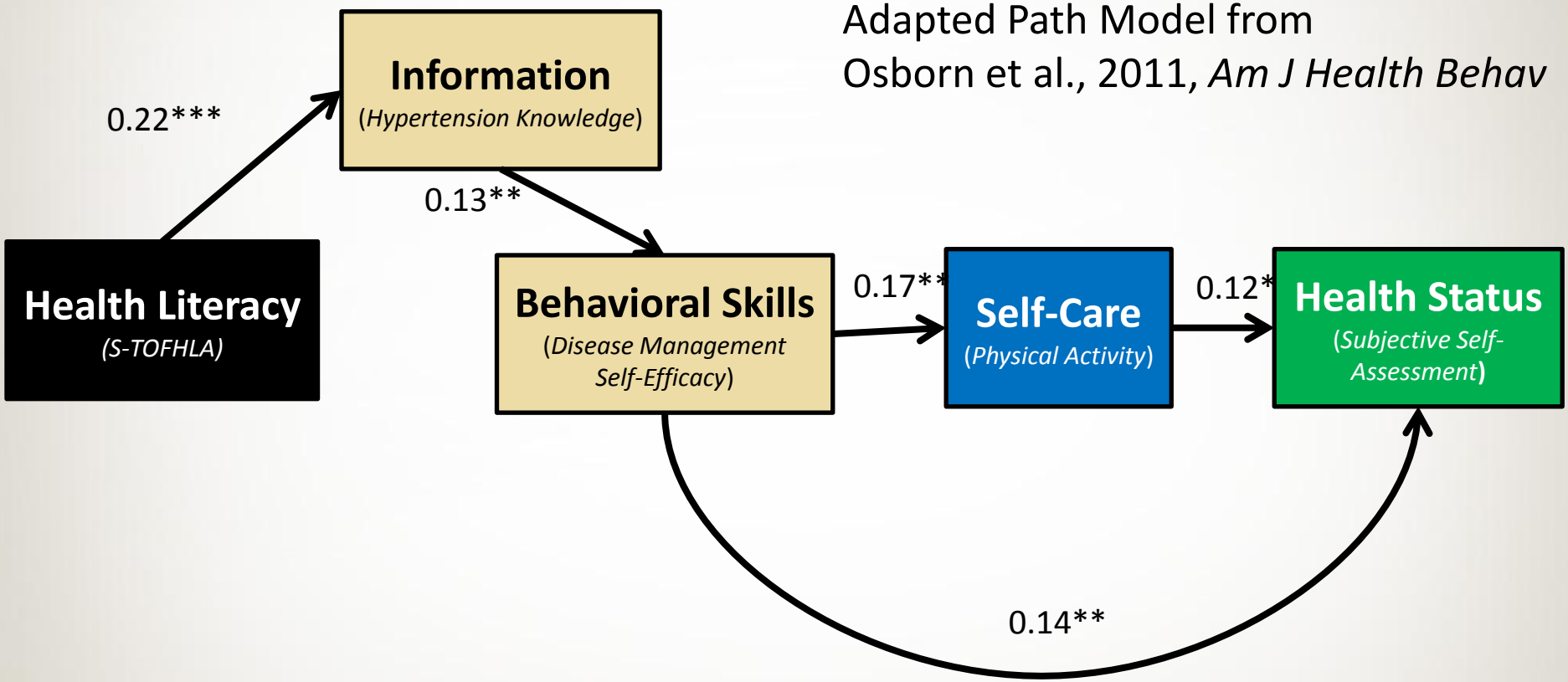
[1]Mayberry & Osborn, under review, *Diabetes Care*
[2]Osborn et al., 2011, *Am J Health Behav*
[3]Osborn, Bains & Egede, 2010, *Diabetes Technol Ther*

Background



Adapted Path Model from
Osborn et al., 2011, *Am J Health Behav*

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Coefficients are standardized path coefficients.
*p<0.05, **p<0.01, ***p<0.001

Background

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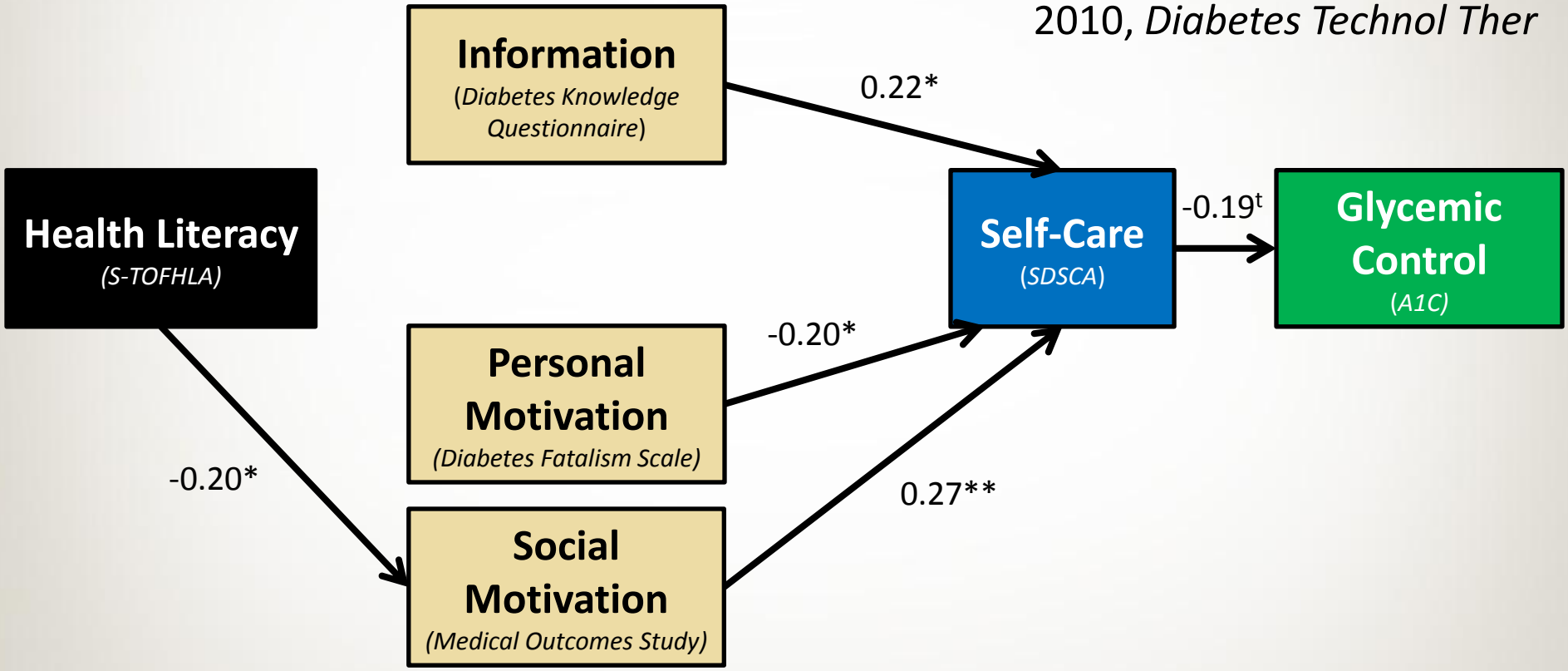

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Coefficients are standardized path coefficients.
*p<0.05, **p<0.01, ***p<0.001

Study Objective

- We examined the relationships between health literacy and each of the IMB model components as potential mechanisms by which health literacy affects health behaviors and, in turn, health outcomes.

Methods

Procedure:

- Recruited 314 consecutive patients at a Federally Qualified Health Center (FQHC) in Nashville, TN.
- Eligibility:
  - Age ≥ 18 years
  - Diagnosed with T2DM
  - Prescribed diabetes medications
- Exclusion criteria:
  - Visual, auditory, speech or cognitive impairment
  - No social security number
  - All medications administered by a caregiver
- A clinic nurse administered a point-of-care A1C test.
- A trained research assistant conducted structured in-person interviews and chart reviews.

Methods

Self-Report Measures:

- **Health Literacy** - Short Test of Functional Health Literacy in Adults (S-TOFHLA)[1]
- **Information** - Diabetes Medication Knowledge Questionnaire (DMKQ)[2]
- **Motivation** (Personal) - Medicines for Diabetes Questionnaire (MDQ-bb)[3]
- **Motivation** (Social) - Medicines for Diabetes Questionnaire (MDQ-nb)[3]
- **Behavioral Skills** - Revised Medication Adherence Self-Efficacy Scale (MASES-R)[4]
- **Medication Adherence** - Adherence to Refills and Medications Scale for Diabetes (ARMS-D) reverse coded[5]

[1]Baker et al., 1999, *Patient Educ Couns*
[2]McPherson et al., 2008, *Res Social Adm Pharm*
[3]Farmer, Kinmonth & Sutton, 2006, *Diabet Med*
[4]Fernandez et al., 2008, *J Behav Med*
[5]Mayberry et al., 2013, *Diabetes Res Clin Pr*

Methods

Analysis:

- Bivariate Correlations
  - Spearman's ρ correlations

- Multivariate Regression Models
  - Conducted unadjusted and adjusted linear regression models for each IMB model component with a significant ($p \leq 0.05$) ρ with health literacy
  - A priori covariates in adjusted models:

Age	Insurance status
Gender	Diabetes duration
Race	Insulin status
Education	

Participants' demographic characteristics	
N = 314	**M ± SD or %**
Age, years	51.8 ± 11.7
Female gender	65%
Race	
Caucasian/White	37%
African American/Black	53%
Other race	10%
Hispanic ethnicity	8%
Education, years	11.9 ± 2.9
Income	
<$10K	45%
$10-$15K	26%
$15-$25K	14%
>$25K	15%
Insurance Status	
Uninsured	45%
Publicly insured	46%
Privately insured	9%

Participants' clinical characteristics	
N = 314	**M ± SD or n %**
Diabetes duration, years	7.7 ± 6.7
Treatment Regimen	
Insulin only	23%
Oral agents only	54%
Both	23%
Glycemic Control (A1C), %	8.2 ± 2.2

Participants' health literacy scores	
N = 311	**M ± SD or %**
S-TOFHLA	26.0 ± 11.2
Inadequate (0-16)	21%
Marginal (17-22)	7%
Adequate (23-36)	72%

Results

Construct/Outcome	Measure	Mean ± SD	Spearman's ρ with Health Literacy	
			ρ	*p*-value
Health Literacy	S-TOFHLA	24.7 ± 12.4	–	–
Information	DMKQ	4.3 ± 1.4	**0.33**	**<0.001**
Personal Motivation	MDB-bb	3.9 ± 0.5	**0.12**	**0.030**
Social Motivation	MDQ-nb	4.3 ± 0.5	**0.34**	**<0.001**
Behavioral Skills	MASES-R	3.5 ± 0.5	-0.10	0.088
Medication Adherence	ARMS-D	39.1 ± 5.0	**-0.15**	**0.010**
Glycemic Control	A1C	8.2 ± 2.2	0.06	0.315

Health literacy was associated with information, personal motivation, and social motivation, and marginally associated with adherence.

Results

	Information (DMKQ)		**Personal Motivation** (MDQ-bb)		**Social Motivation** (MDQ-nb)		**Medication Adherence** (ARMS-D)	
	β	*p*-value	β	*p*-value	β	*p*-value	β	*p*-value
Unadjusted	**0.30**	**<0.001**	0.07	0.273	**0.30**	**<0.001**	-0.09	0.130
Adjusted*	**0.18**	**0.009**	0.09	0.250	**0.22**	**0.002**	-0.07	0.334

* *Adjusted for age, gender, race (white vs. non-white), education, insurance status, diabetes duration, & insulin status.*

In adjusted models, health literacy was independently associated with adherence-related information and social motivation to adhere.

Discussion

- Health literacy was independently associated with greater adherence-related information and social motivation to adhere…

  …but ***not*** with adherence-related behavioral skills (self-efficacy), actual adherence, or glycemic control.

- Health literacy may indirectly influence self-care and glycemic control through its relationships with factors that determine these outcomes

Discussion

Health literacy predicts adherence-related information and motivation.

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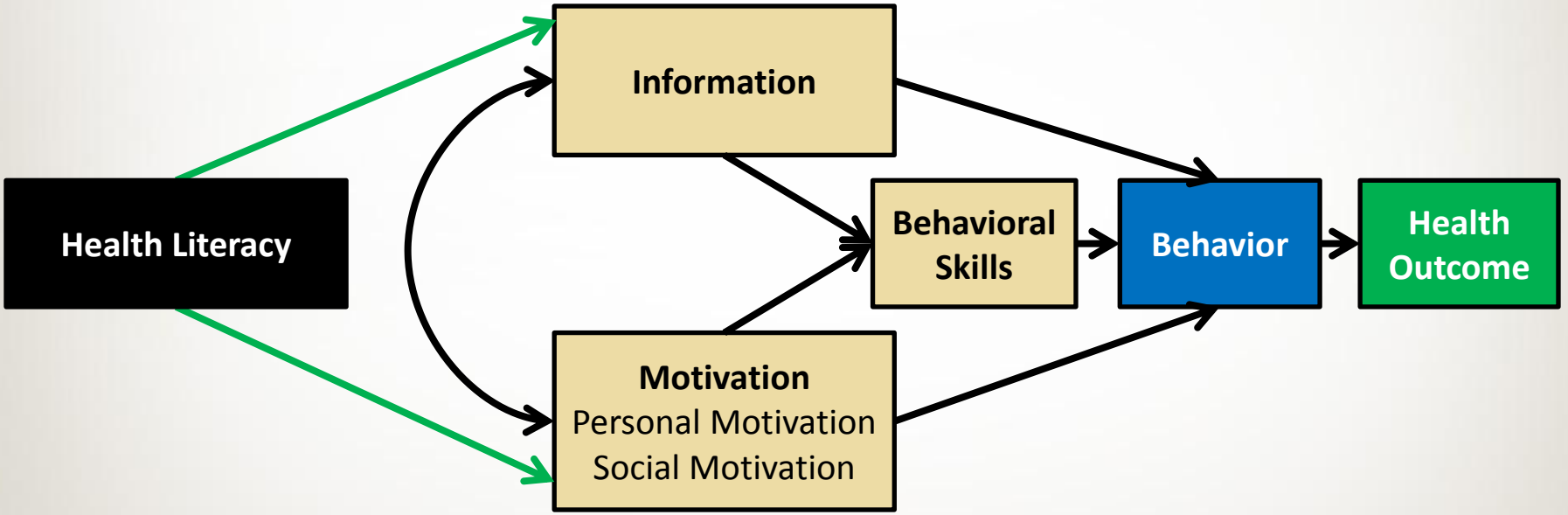

Limitations

- Sampling from a single FQHC, study design, self-report measures, and not accounting for the potential influence of regimen complexity

Future Directions

- Examine indirect effects of health literacy on adherence and clinical outcomes through patients' behavior-related information and social motivation

- Determine the efficacy of health literacy-appropriate interventions that address adherence-related information and social motivation