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A Model Testing on Health Literacy, Knowledge about Vitamin D, and Actual Behavior in Sunlight Exposure

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Background

- Health literacy (HL) has been prioritized in public health and rigorously studied since the 1990s.
- HL is defined as **the ability to receive, process, and understand basic health information and make health decisions using that information** (Nielsen-Bohlman, Panzer, & Kindig, 2004)
- Poor health literacy is associated with
  - poor physical and mental health (Wolf, Gazmararian, & Baker, 2005)
  - higher hospitalization rates (Baker et al., 2002)
  - Less use of flu vaccination (Miller, 2004; Scott, Gazmararian, Williams, & Baker, 2002)
  - increased mortality (Baker et al., 2007; Sudore et al., 2006)

HL, Determinants of Health Behavior and Health Behavior

- Knowledge and motivation were considered as factors contributing to the development of health literacy (Baker,2006; Nutbeam, 2008); **KN + M >> HL**
- HL influences knowledge, which in turn affects health outcomes (Lee et al., 2004; Paasche-Orlow & Wolf, 2007); **HL >> KN >> OC**
- knowledge affected health literacy skills and eventually led to health-related behavior and outcomes (Squiers, Peinado, Berkman, Boudewyns, and McCormack, 2012); **KN >> HL >> Beh**


Motivation
Health Literacy
Health Behavior
Knowledge

Vitamin D and sunlight exposure

- **Vitamin D deficiency is common among older adults; however, it is often under-recognized** (Dharmarajan, Akula, Kuppachi, & Norkus, 2005; Wat, Leung, Tam, & Kung, 2007).
- **Vitamin D can be supplemented by three methods:**
  - **diet (oily fish, cod-liver oil, and egg yolks)**
  - **dietary supplements, and**
  - **ultraviolet B radiation from the sun**
- **Exposure to sunlight for 15–30 minutes raises serum vitamin D (Chel et al., 1998)**

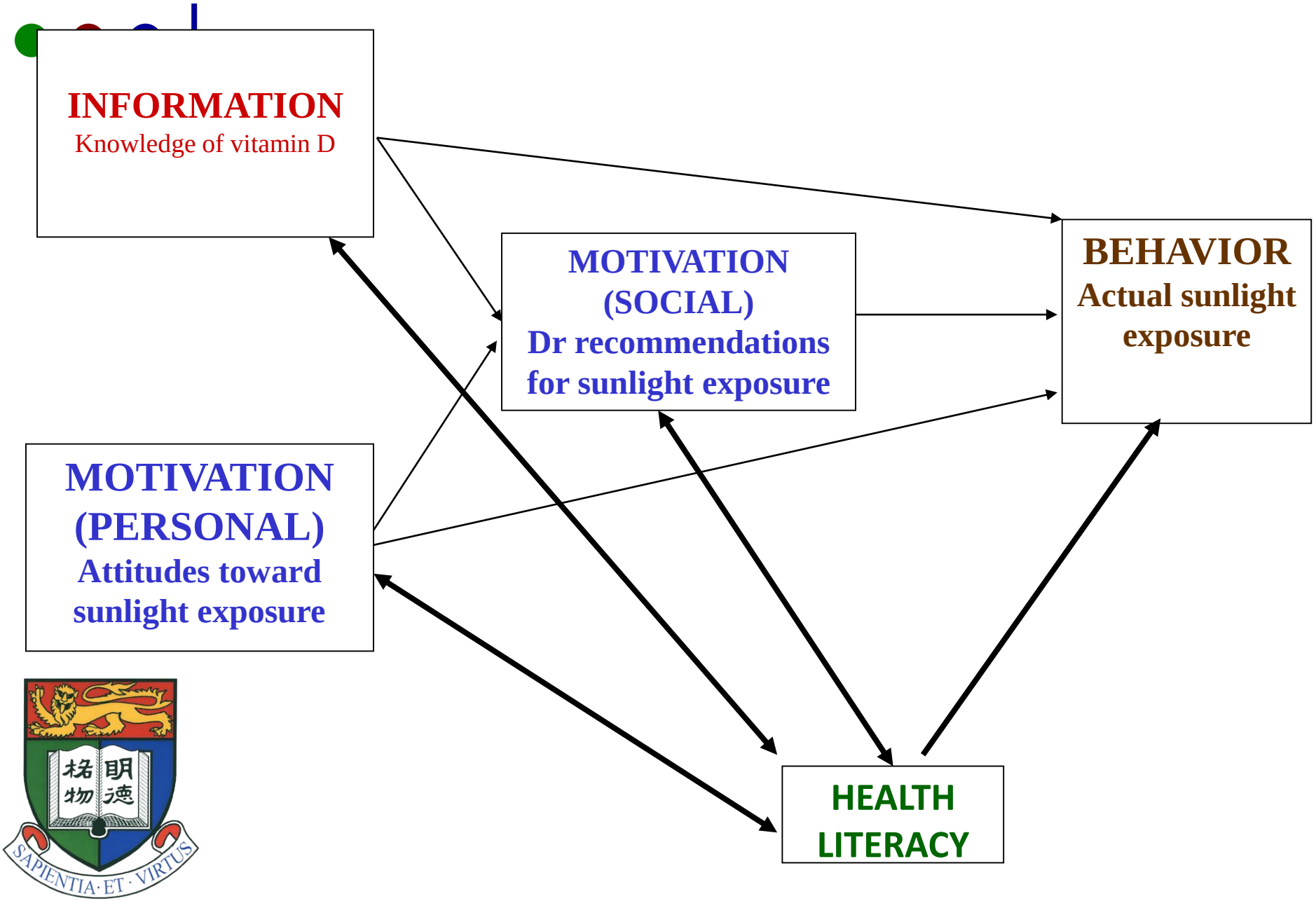
Aims of the study

- to assess whether health literacy play a role in the complex relationship among knowledge, motivation (both personal and social motivation), and health behavior.

Research questions

1. Are knowledge about vitamin D (**KN**), attitude towards sunlight (**Motivation**), doctor recommendation (**Motivation**), and health literacy (**HL**) directly associated with sunlight exposure behavior (**Beh**)?
2. Would **HL** serve as a determinant of **KN** and **Motivation** and these in turn affect sunlight exposure behavior **(Beh)**?
3. Would **KN** and **Motivation** affect **HL**, which in turn influences sunlight exposure behavior (**Beh**)?

Fig. 1. Conceptual framework of the proposed study



Method

- Cross-sectional survey with 23 residential care homes for elders and 7 local community centres for older adults in HK from May 2011 to Jan 2012
- Inclusion criteria:
  - **aged 65 or older**
  - **ethnic Chinese**
  - **cognitively intact (Short Portable Mental Status Questionnaire score > 7)**
  - **able to communicate in Cantonese or Mandarin**
  - **living in a residential care home for older adults for at least 3 months**
- Structural equation modeling was employed

Measures

- **Sunlight exposure behavior**
  - "In the last 7 days, how long did you expose yourself to sunlight every day on average?" Ten choices were offered.
  - Recode it as 1 = sufficient sunlight exposure; 0 = insufficient
- **Health literacy**
  - the 24-item Chinese Health Literacy Scale for Chronic Care (Leung et all, 2013)

Measures

- **Knowledge of vitamin D**
  - bone health
  - calcium absorption
  - can be supplemented by sunlight exposure
  - The minimum time needed for sunlight exposure in summer / in winter
- **Attitude toward sunlight exposure**:
  - "I like sunlight"
  - "I like outdoor activities"
  - "The time I expose myself to sunlight is enough."
- **Doctor recommendations**:
  - "Has your doctor ever recommended that you receive sunlight exposure?"

Demographics

		N	%
Age	Mean (SD)	79.2	(8.38)
Gender	Female	499	77.0
Education	No formal education	271	41.8
	Primary (Grade 1-6)	265	40.9
	Secondary (Grade 7-13)	90	13.9
	Tertiary/University	22	3.4
Marital	Single, divorced, widowed	430	66.4
	Married	218	33.6
Occupation	Retired	537	82.9
	Homemaker	109	16.8
	Employed	2	0.3
Living status	Residential care homes	279	43.1
	Own homes	369	56.9
Number of years living in RCH	Mean (SD)	5.5	(4.8)
Number of illness		2.2	1.36

Table 2. *Knowledge about Vitamin D (correct response)*

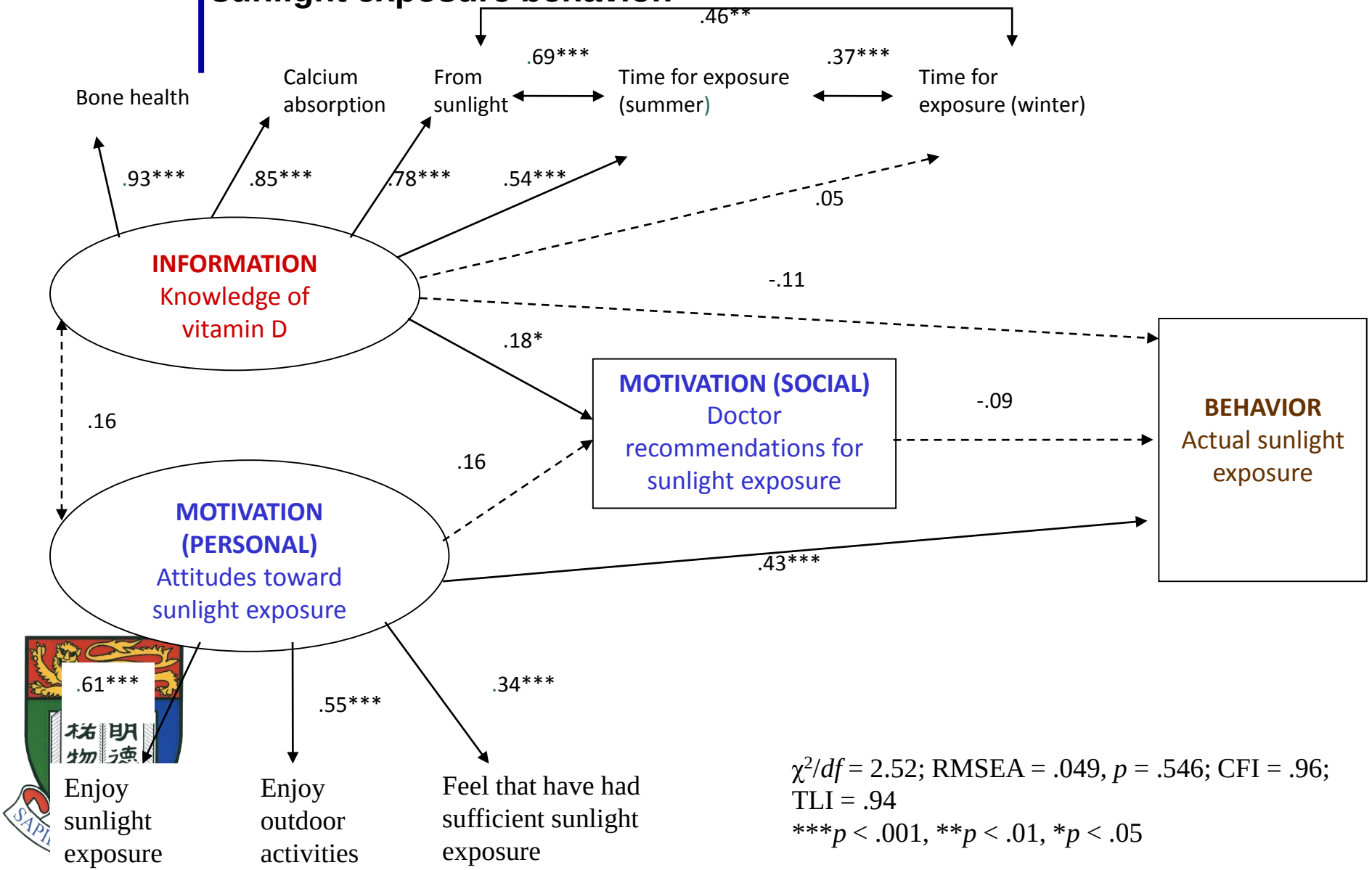
	n	%
Vitamin D is for maintaining bone health	96	14.8
Vitamin D is for supporting calcium absorption	70	10.8
Vitamin D can be increased by sunlight exposure	141	21.8
Minimum time for sunlight exposure in summer is 30 minutes	124	19.1
Minimum time for sunlight exposure in winter is 60 minutes	68	10.5

Table 3. Motivation, Behavior and Health Literacy

	M	%(SD)
Attitudes toward sunlight exposure *		
Enjoy sunlight exposure	3.6	(1.3)
Enjoy outdoor activities	4.2	(0.9)
Feel that have had sufficient sunlight exposure	3.2	(1.3)
Doctor recommendation for more sunlight exposure	189	29.2
Actual behavior for sufficient sunlight exposure	74	11.5
Health literacy #	29	(11.8)

* Ranged from 1 to 5, higher score indicated higher preference.
# Ranged from 0 to 48, higher score indicated higher level of health literacy.

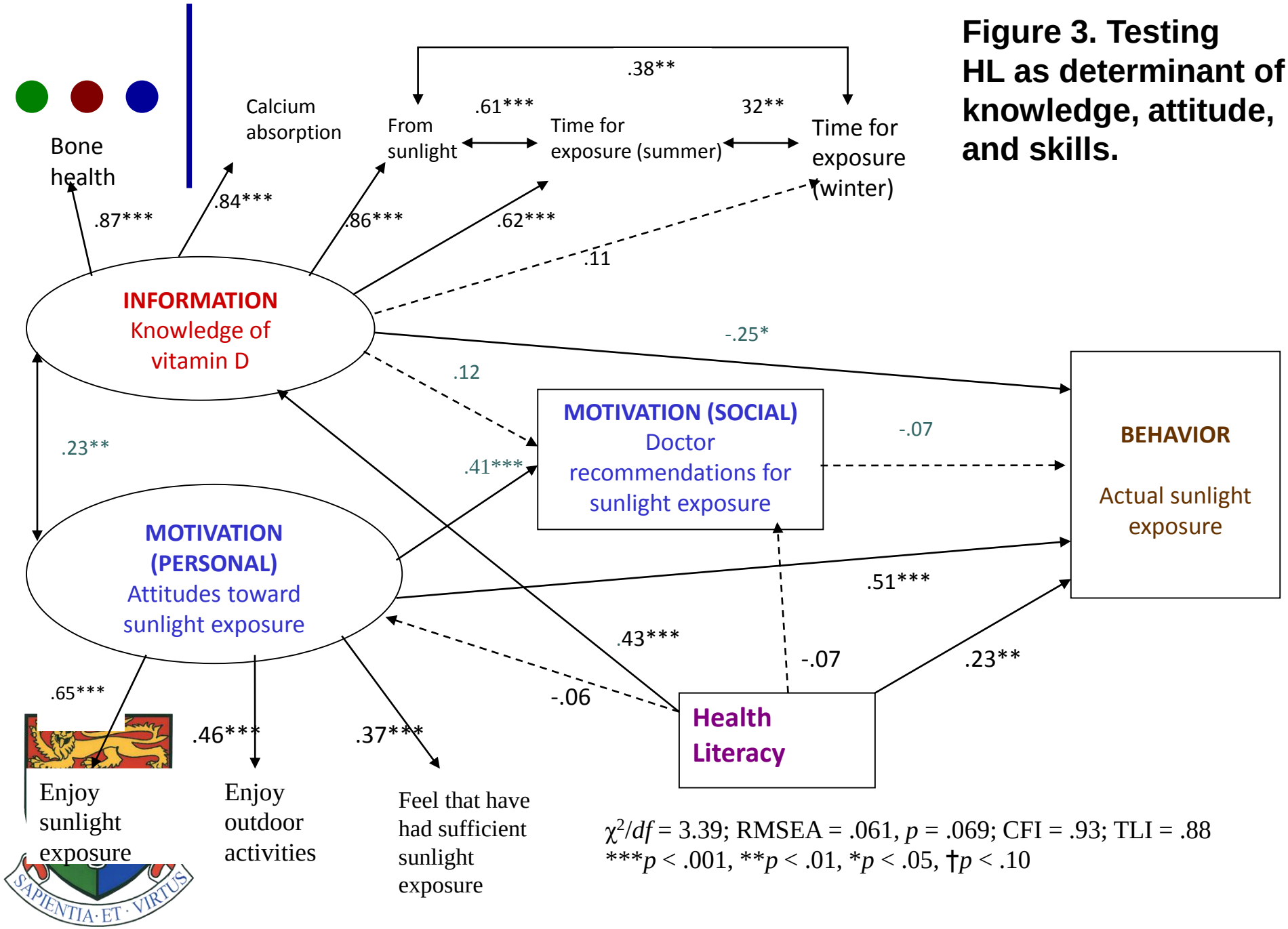
Fig. 2. Testing the relationships among knowledge of vitamin D, attitudes toward sunlight exposure, doctor recommendations, and sunlight exposure behavior.



$\chi^2/df = 2.52$; RMSEA = .049, $p = .546$; CFI = .96; TLI = .94

$^{***}p < .001$, $^{**}p < .01$, $^{*}p < .05$

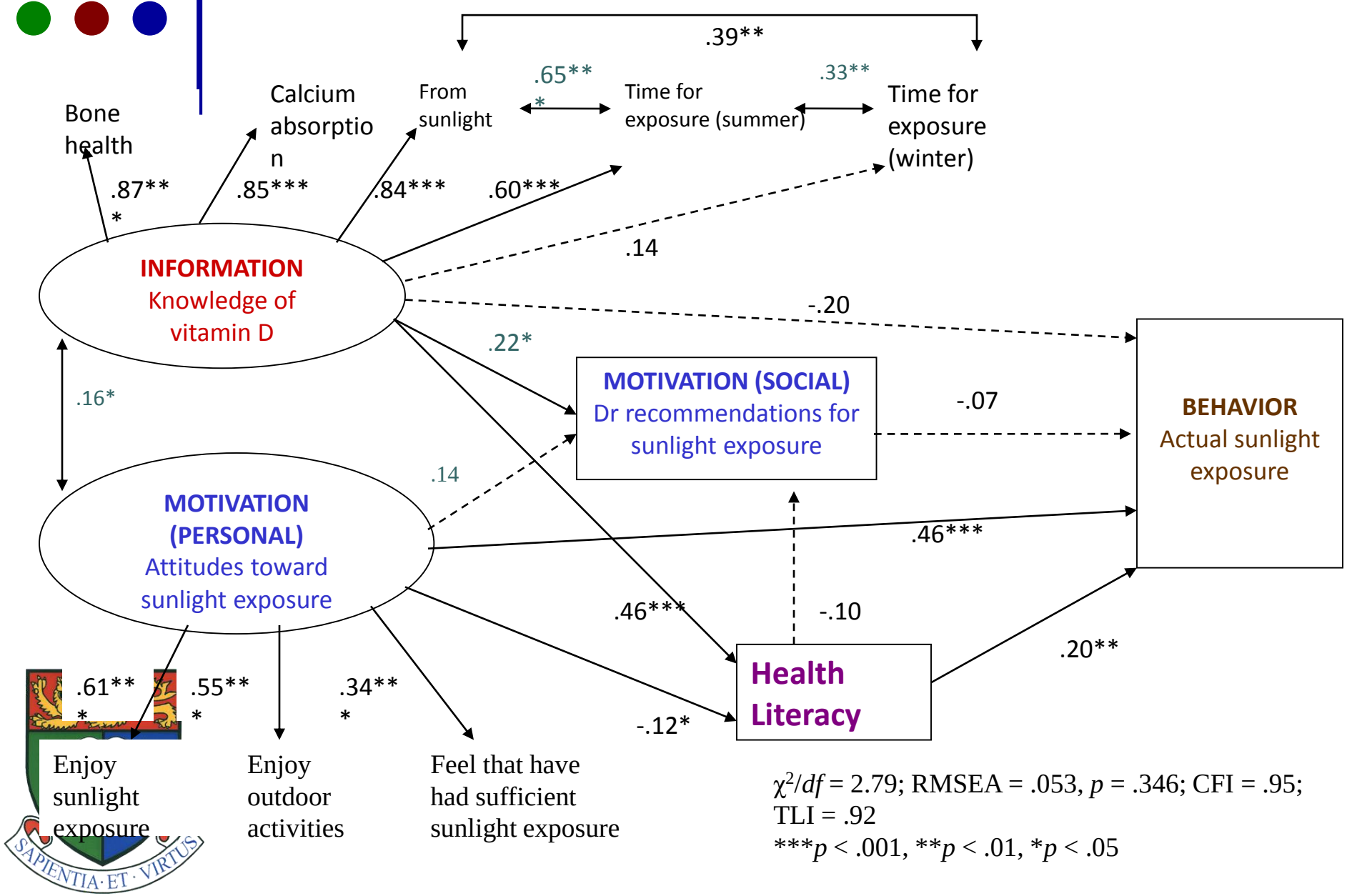
Figure 3. Testing HL as determinant of knowledge, attitude, and skills.



$\chi^2/df = 3.39$; RMSEA = .061, $p = .069$; CFI = .93; TLI = .88

$^{***}p < .001$, $^{**}p < .01$, $^{*}p < .05$, †$p < .10$

Fig 4. Testing HL as a mediator of the relationships between knowledge and behavior and between attitude and behavior.



$\chi^2/df = 2.79$; RMSEA = .053, $p = .346$; CFI = .95; TLI = .92

$^{***}p < .001$, $^{**}p < .01$, $^{*}p < .05$

Discussion

- We found that HL was an important factor leading to behavioral change
  - had a direct association with health behavior
  - involved in the indirect relationship between knowledge and behavior
- when individuals possess sufficient knowledge about vitamin D and appropriate levels of health literacy, they are more likely to engage in behavioral change, i.e., receiving appropriate sunlight exposure.

Discussion

- Health literacy also linked the relationship between attitudes and health behavior
  - Attitudes were found to be negatively associated with health literacy, yet health literacy was positively associated with health behavior.

>>>> individuals with negative attitudes toward sunlight exposure could still engage in sunlight exposure if they possess high levels of health literacy.

Discussion

- Doctor recommendations are not sufficient to affect health behavior.
  - They had a significant relationship with knowledge of vitamin D.
- Doctors may have only mentioned the knowledge-oriented concept of vitamin D and sunlight exposure in their recommendations without rectifying myths about sunlight exposure
  - thus failing to convince older Chinese adults to change their behavior.

Implications and Conclusion

- Health educators could consider developing interventions to train older adults in
  - both **health knowledge** and **health literacy** skills to impart strategies for increasing their vitamin D levels.
  - By increasing their level of **health literacy,** they may be more likely to engage in appropriate sunlight exposure. (those with negative attitudes toward sunlight exposure)

THANK YOU!

Comments are welcome

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