Do Gender and Chronological Age Influence Patterns of Causal Relationships Between Health and Psychological Age? A Cross-Lagged Panel Analysis.

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Abstract

Psychological age (PA) concepts have been studied across many disciplines, and health factors have consistently been shown to be related with PA. However, it remains unclear whether the direction of the relationship is from health to PA, PA to health, or through mutual causation, or if it is consistent across age groups or between genders. Utilizing a sample of 409 working adults, this study examined the relationship between PA and health longitudinally. Cross-lagged panel analysis revealed different causal patterns by age and gender. Social comparison theory may explain the temporal ordering of the relationship.

Introduction

- Researchers studying aging workers have expressed misgivings about the inadequacy of using chronological age (CA) as a proxy of expected common behaviors

- Psychological perspectives of age (e.g., felt age, i.e. the age one feels; and discrepancies between felt age and chronological age) have been suggested as meaningful alternative measures of age.

- Psychological age (PA) concepts have consistently been shown to be related with health; however, the overwhelming majority of this existing research (a) has focused on older individuals in community settings (b) using cross-sectional analysis.

- It remains unclear whether the direction of the relationship is from health to PA, PA to health, or through mutual causation.

- Theoretical arguments have been made in support of both causal directions.
  - Stereotype embodiment theory (SET; Levy, 2009) purports that personally held age stereotypes manifest as health outcomes (i.e. PA → health)
  - Social comparison theory (SCT; Festinger, 1954) offers reasoning of health cues acting as antecedents to personal construals of age (i.e., Health → PA).
- Furthermore, it is uncertain if the PA-health relationship is consistent across age groups or between genders.

Hypotheses.

1. Health is negatively related to PA
2. PA is an antecedent to health (SET perspective)
3. CA will moderate the relationship between PA and health; the relationship will be stronger for older workers compared to younger workers
4. Gender will moderate the relationship between PA and health; the relationship will be stronger for females.

Methods

Participants

409 workers from six manufacturing organizations located in Northeastern US, surveyed 3 times at 1.5 year intervals

	Whole Sample	Age Categories		Gender	
		< 50 yrs	50 + yrs	Male	Female
N (%)	409	224 (54.8%) (72.3% Male)	185 (45.2%) (73% Male)	297 (72.6%)	112 (27.4%)
T1 Age (*M, SD, Min, Max*)	47.9 (9.83), 23.3 – 70.7	40.9 (7.27), 23.3 – 49.9	56.4 (4.2), 50 – 70.7	47.7 (9.96), 23.3 – 68.3	48.5 (9.49), 25.5 – 70.7
% White	84.6%	81.7%	88.1%	85%	88%
% Married	76.5%	72.3%	81.6%	80%	65.2%
% College or Graduate Degree	43.3%	45.6	40.6%	45.5%	35.7%
Tenure (*M, SD*)	15.5 (11.9)	10.7 (8.63)	21.8 (12.46)	15.4 (12.11)	16.6 (11.34)
% Income ≥ $75K	66.5%	63.4%	70.2%	71.4%	53.6%

Age Group
## *Covariance*\Correlation Matrices

Under Age 50

	M	SD	1	2	3	4	5	6
1 T1 PDPA	-0.11	0.185	*.034*	**-.207****	**.34*****	**-.137***	**.381*****	**-.139***
2 T1 GHr	-0.01	0.768	*-.029***	*.59*	**-.128**	**.597*****	**-.241*****	**.599*****
3 T2 PDPA	-0.11	0.189	*.012****	*-.019*	*.036*	**-.132***	**.452*****	**-.139***
4 T2 GHr	0.00	0.812	*-.021**	*.373****	*-.02**	*.066*	**-.295*****	**.654*****
5 T3 PDPA	-0.08	0.158	*.011****	*-.029****	*.013****	*-.038****	*.025*	**-.272*****
6 T3 GHr	-0.01	0.775	*-.02**	*.357****	*-.02**	*.411****	*-.033****	*.6*

50 and Over

	M	SD	1	2	3	4	5	6
1 T1 PDPA	-0.15	0.148	*0.022*	**-.314*****	**.504*****	**-.256*****	**.401*****	**-.281*****
2 T1 GHr	0.01	0.709	*-.033****	*.503*	**-.358*****	**.649*****	**-.17***	**.537*****
3 T2 PDPA	-0.15	0.142	*.011****	*-.036****	*.02*	**-.316*****	**.544*****	**-.395*****
4 T2 GHr	-0.01	0.738	*-.028****	*.34****	*-.033****	*.545*	**-.193****	**.7*****
5 T3 PDPA	-0.15	0.156	*.009****	*-.019**	*.012****	*-.022***	*.024*	**-.301*****
6 T3 GHr	0.02	0.703	*-.029****	*.268****	*-.039****	*.363****	*-.033****	*.494*

Under 50: Final Model

Model	χ2	df	Model Comparison	Δχ2	Δdf	p	RMSEA	RSMEA 90% CI	CFI	TFI	Better Fit?
M1: Autoregressive only	16.333	6	--	--	--	--	.088	.038, .14	.971	.932	--
M2: Health → PA	.659	3	M1	15.674	3	***	0	0, .054	1	1.031	Yes
M3: PA → Health	15.607	3	M1	.726	3	NS	.137	.075, .207	.964	.833	No
M4: Reciprocal Paths	0	0	M1	16.333	6	*	0	0, 0	1	1	Yes
			M2	0.659	3	NS					No
			M3	15.607	3	***					Yes
Final Model	1.704	5	M2	1.045	2	NS	0	0, .043	1	1.026	Yes
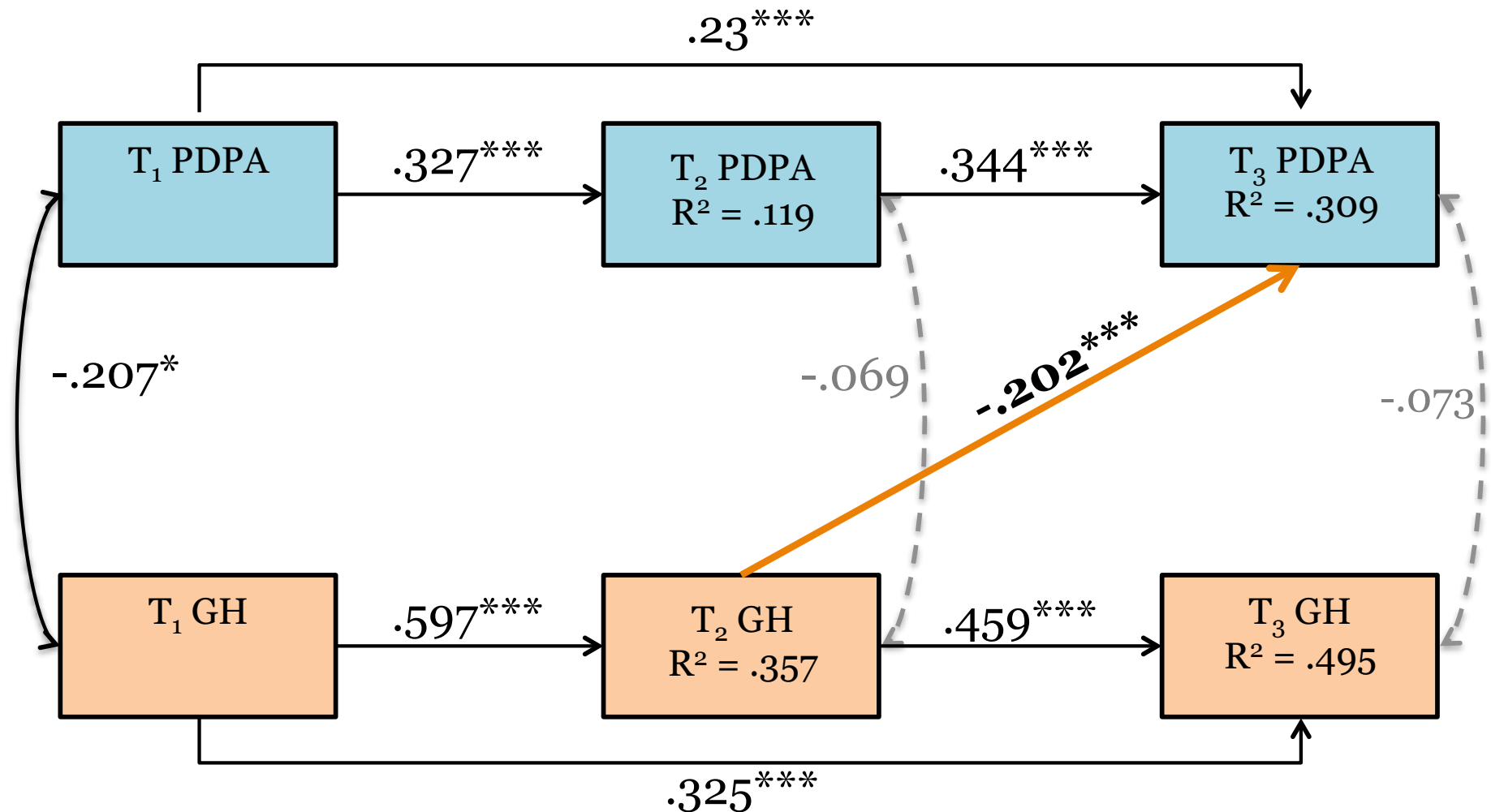
50 and Older: Final Model

Model	χ^2	df	Model Comparison	$\Delta\chi^2$	Δdf	p	RMSEA	RSMEA 90% CI	CFI	TFI	Better Fit?
M1: Autoregressive only	24.037	6	--	--	--	--	.127	.077, .183	.951	.886	--
M2: Health → PA	11.317	3	M1	12.72	3	**	.122	.052, .202	.978	.895	Yes
M3: PA → Health	12.686	3	M1	11.351	3	**	.132	.063, .211	.974	.878	Yes
M4: Reciprocal Paths	0	0	M1	24.037	6	*	0	0, 0	1	1	Yes
			M2	11.317	3	*					Yes
			M3	12.686	3	**					Yes
Final Model	4.876	5	M4	4.876	5	NS	0	0, .101	1	1	Same
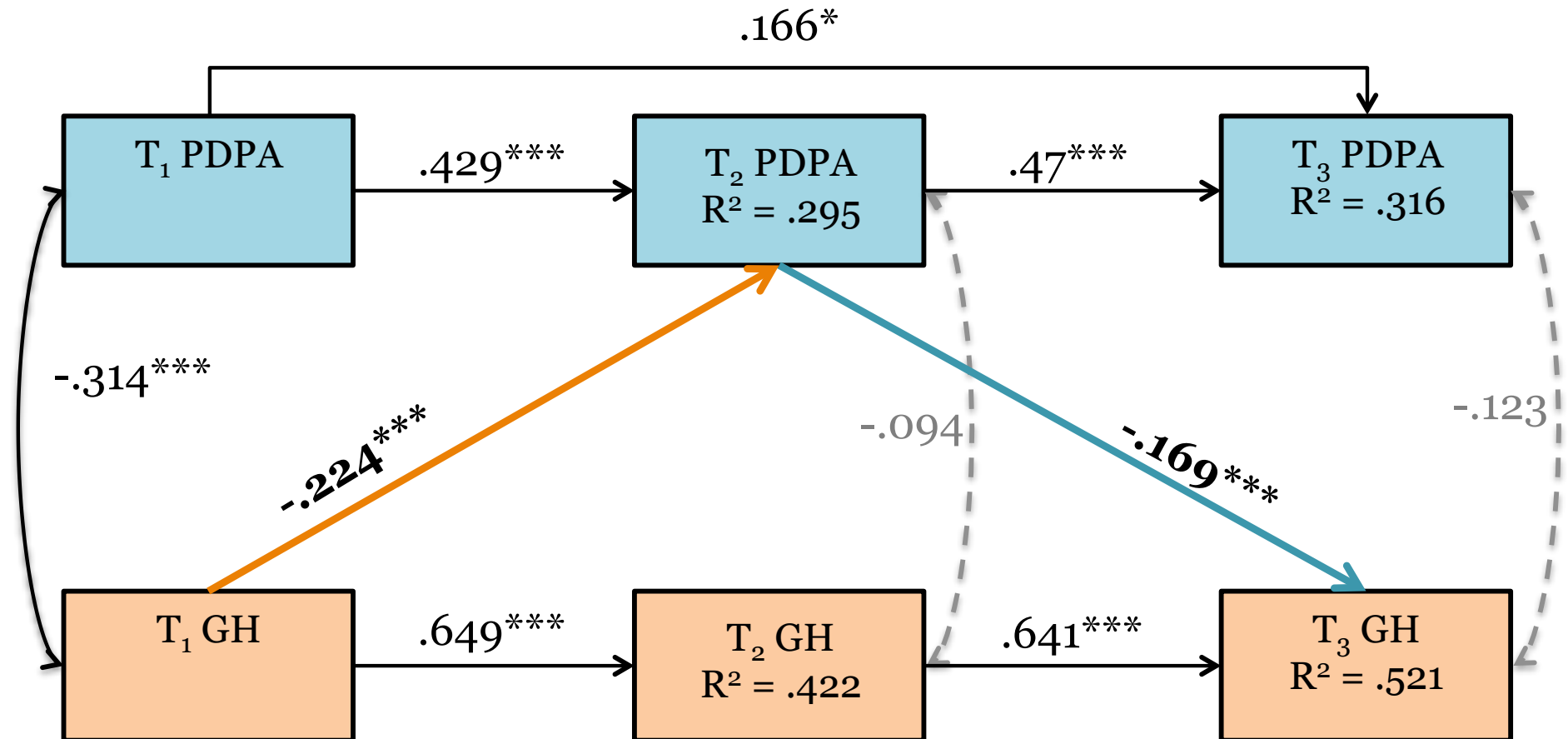
Measures

- ***Psychological Age***
  - Proportional discrepancy between Felt Age (i.e., How old do you feel; measured in years; Underhill & Cadwell, 1983) and Chronological Age (CA): (FA-CA)/CA
    - Values interpreted as the percentage older/younger a person feels in relation to their CA (i.e., +.25 = feeling 25% older than CA; -.25 = feeling 25% younger than CA)
- ***General Health***: In general, would you say your health is… (1 = poor, 5 = excellent; Ware, Kosinski, & Keller, 1996)
  - Unstandardized residual value after accounting for potential confounding effect of covariate variables

- ***Moderators***
  - Age group: under 50, 50 and over
  - Gender

- ***Covariates***
  - T1 CA
  - Marital status
  - Gender
  - Income

Gender
Covariance\Correlation Matrices

Males

	M	SD	1	2	3	4	5	6
1 T1 PDPA	-.13	.176	*.031*	**-.218***	**.363***	**-.172**	**.370***	**-.164**
2 T1 GHr	0	.745	-.029***	*.554*	**-.158**	**.621***	**-.172**	**.561***
3 T2 PDPA	-.13	.180	.012***	-.021**	*.032*	**-.181**	**.432***	**-.184***
4 T2 GHr	0	.811	-.025**	.375***	-.026**	*.658*	**-.241***	**.711**
5 T3 PDPA	-.11	.165	.011***	-.021**	.013***	-.032***	*.270*	**-.251***
6 T3 GHr	0	.775	-.022**	.323***	-.026***	.447***	-.032**	*.600*

Females

	M	SD	1	2	3	4	5	6
1 T1 PDPA	-.11	.154	*.024*	**-.336***	**.561***	**-.201***	**.509***	**-.299***
2 T1 GHr	0	.736	-.037***	*.542*	**-.393***	**.615***	**-.322***	**.623***
3 T2 PDPA	-.12	.143	.012***	-.041***	*.02*	**-.250**	**.728***	**-.418***
4 T2 GHr	0	.689	-.21*	.312***	-.025**	*.475*	**-.263**	**.527***
5 T3 PDPA	-.10	.146	.011***	-.035***	.015***	-.026**	*.021*	**-.399***
6 T3 GHr	0	.651	-.03***	.299***	-.039***	.237***	-.038***	*.424*

Males: Final Model

Model	χ^2	df	Model Comparison	$\Delta\chi^2$	Δdf	p	RMSEA	RSMEA 90% CI	CFI	TFI	Better Fit?
M1: Autoregressive only	16.602	6	--	--	--	**	.077	.034, .123	.977	.946	--
M2: Health → PA	3.913	3	M1	12.689	3	**	.032	.000, .108	.998	.991	Yes
M3: PA → Health	12.328	3	M1	4.274	3	NS	.102	.048, .165	.980	.905	No
M4: Reciprocal Paths	0	0	M1	16.602	6	**	0	0, 0	1	1	Yes
			M2	3.913	3	NS					
			M3	12.328	3	**					
M5: Trimmed M2	4.145	4	M2	.232	1	NS	**0.011**	**0, .089**	**1**	**.999**	Yes
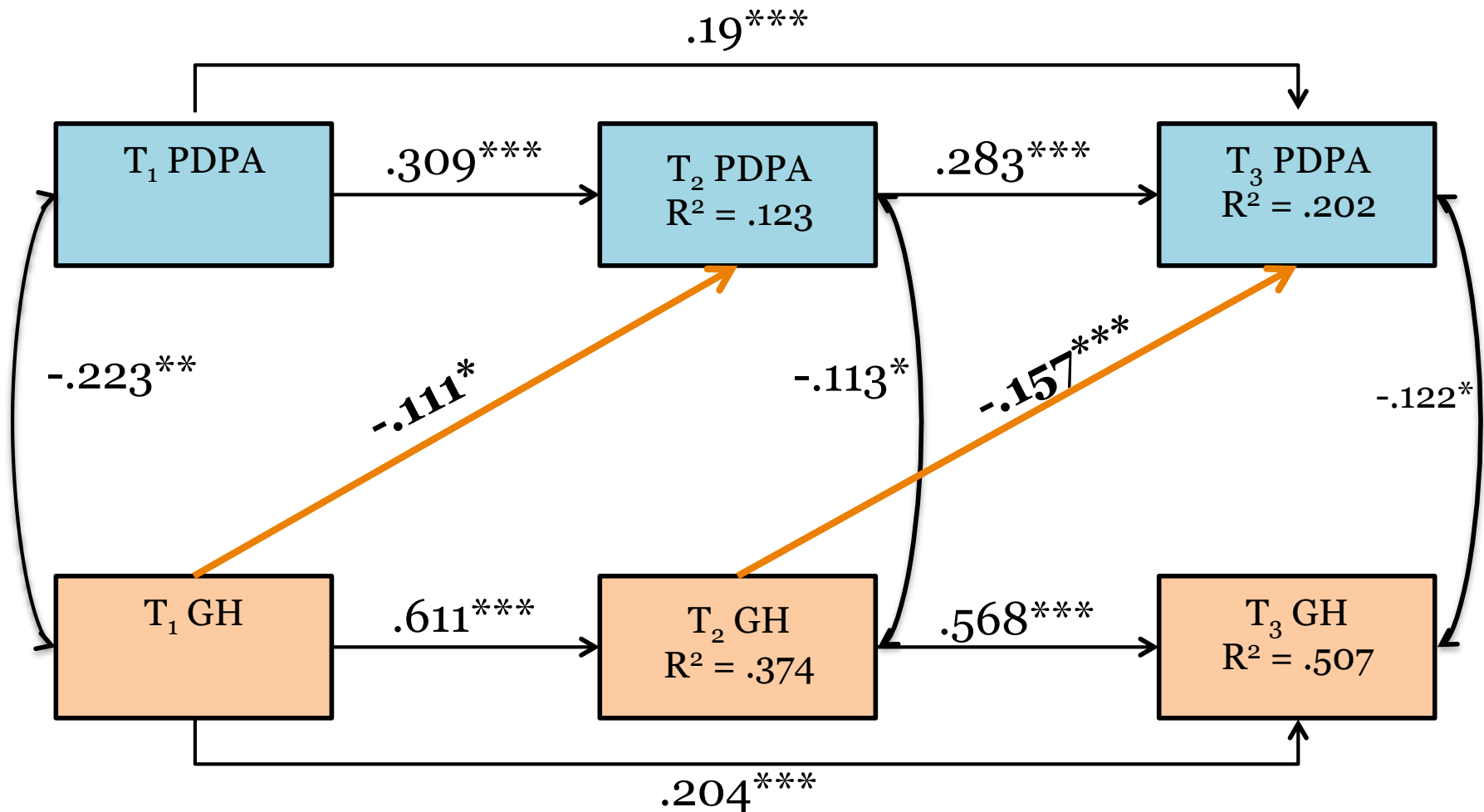
Females: Final Model

Model	χ2	df	Model Comparison	Δχ2	Δdf	p	RMSEA	RSMEA 90% CI	CFI	TFI	Better Fit?
M1: Autoregressive only	17.19	6	--	--	--	**	.129	.06, .203	.946	.875	--
M2: Health → PA	6.544	3	M1	10.646	3	*	.103	.000, .212	.983	.921	Yes
M3: PA → Health	10.512	3	M1	6.678	3	NS	.15	.058, .252	.64	.832	No
M4: Reciprocal Paths	0	0	M1	17.19	6	**	0	0, 0	1	1	Yes
			M2	6.544	3	NS					No
			M3	10.512	3	**					Yes
M5: Trimmed M2	9.201	5	M2	2.657	2	NS	.087	0, .173	.980	.944	Yes

$.23^{***}$

T_1 PDPA

$.327^{***}$

T_2 PDPA
$R^2 = .310$

$.344^{***}$

T_3 PDPA
$R^2 = .436$

$-.332^{***}$

$-.240^{**}$

$-.042$

$-.077$

T_1 GH

$.582^{***}$

T_2 GH
$R^2 = .339$

$.241^{***}$

T_3 GH
$R^2 = .388$

$.451^{***}$
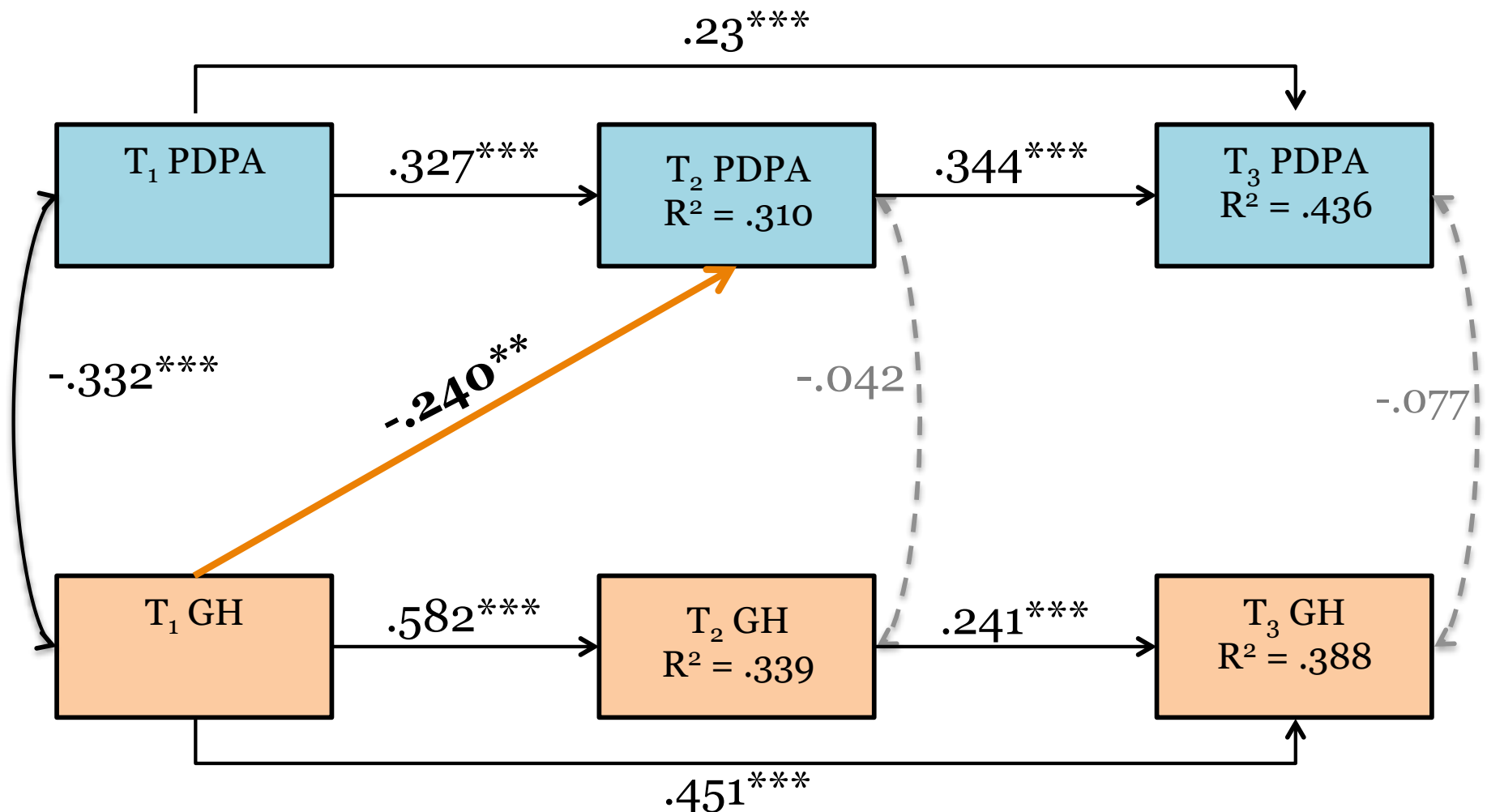
Results

Multi-group invariance testing (Kenny, 2012) revealed group differences for both age groups and gender.

Cross-lagged panel path analysis was used to test the hypotheses. Nested models were analyzed using Mplus 6.13 (Muthén & Muthén, 2010).

- M1: Null model; autoregressive paths only
- M2: Cross-lagged paths from Health to PDPA and autoregressive paths
- M3: Hypothesized model; cross-lagged paths from PDPA to Health and autoregressive paths
- M4: Reciprocal paths: Cross-lagged paths from PDPA to Health, Health to PDPA, and autoregressive paths

Model fit indices: $\Delta\chi^2$; RMSEA & 90% CI; CFI; TLI.

Hypothesis Test Results

H1: Partially supported. All observed correlations between PA and health were statistically significant and negative for each of the four subgroups of participants. In the four final estimated structural models, a negative relationship was found for all statistically significant paths (6 paths in total) between PA and health.

H2: Partially supported. Models for the older age group revealed a reciprocal relationship, with significant path from PA to health (T2 PA to T3 health), and a significant path from health to PA (T1 health to T2 PA). However, the favored models for those under age 50 and both genders had significant paths from health to PA, which was contrary to the hypothesis.

H3: Supported. CA did moderate the PA-health relationship, with a stronger relationship displayed for adults age 50 and over compared to those under 50 as seen in the cross-lagged path coefficients.

H4: Partial support. Gender did moderate the relationship between PA and health, but it was stronger for males than females as indicated by the cross-lagged path coefficients.

Discussion

- The causal direction from health to PA seen for the younger group and both genders are consistent with social comparison theory (SCT; Festinger, 1954).
  - Shared group opinions and abilities about health and age tend to adjust to account for discrepancies between stereotypical expectations and personal experiences associated with increasing life stages, so that older-aged groups differ from younger-aged groups in their perception of what is "normal" for a given age.

- The reciprocal relationship between PA and general health for older individuals may imply that one construct is used to form the other. Concepts used to evaluate general health (e.g., feeling optimistic and energetic), as well as health itself, may be used in evaluating PA (Spuling et al. 2013).

Limitations & Future Research

Limitations

- Only one facet of health measured
  - The PA-health relationship may vary according to health facet.
    - e.g., Functional health, which concerns impairment of daily activities due to health conditions, may effect how old a person feels.
- No clinical assessments of health

Future Research

- Other health facets may support the idea of age-related stereotypes manifesting upon entry into old age (e.g., SET)
- Employment status may moderate the PA-health relationship
  - Full- versus part-time positions, temporary versus permanent employment, and employment versus retirement

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