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Youth's Bidirectional Socialization of Importance Beliefs by Parents

DISSERTATION

submitted in partial satisfaction of the requirements
for the degree of

DOCTOR OF EDUCATION

by

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DEDICATION

I dedicate this dissertation to my family and friends who helped me through the toughest times.

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Human Development in Context

ABSTRACT OF THE DISSERTATION

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Distinguished Professor Jacquelynne S. Eccles, Chair

Drawing from Eccles's Expectancy-Value Theory, the three studies in this dissertation adopted within-person cross-lagged panel models to examine youth's bidirectional importance belief socialization by parents in math, sports and music. Using data from the Michigan Study of Adolescent and Adult Life Transitions as well as the Childhood and Beyond dataset, including youth and their parents from 1st to 7th grade, we had two sets of major findings. First, we found that parents influenced youth's importance beliefs in all domains; however, youth only influenced their parents' importance beliefs in leisure domains (i.e., sports and music). Second, in both math and sports, youth's internalization of their parents' values were interfered with or even hijacked by projection. We compared those results with prior research and discussed their theoretical relevance.

Keywords: importance belief, parents, socialization, bidirectionality, projection, within-person

INTRODUCTION

What are youth's importance beliefs and why do they matter? According to Eccles's Expectancy-Value Theory (EEVT), importance beliefs have two components: beliefs about the usefulness of the subject (i.e., "utility value") and how central the subject is to one's identity (i.e., "attainment value"; Eccles et al., 1983; Simpkins, Fredricks, & Eccles, 2015; Wigfield & Eccles, 1992; Wigfield & Eccles, 2000). In other words, the importance youth ascribe to certain subjects can stem from their endorsement of the subjects' as part of their identities (e.g., being a "math/sports/music person"; i.e., "attainment value"), or their acknowledgement of the relevance of the subjects to their future goals (e.g., scholarships or popularity; i.e., "utility value"). Researchers discovered that youth's beliefs of a subject as important for who they are or what they want to achieve in life can be a significant predictor of their domain-specific engagement and achievement (e.g., Harackiewicz et al., 2014; Raedeke, 1997; Simpkins, Fredricks, & Eccles, 2012; Wigfield, 1994). However, the question remains as to how youth's importance beliefs develop and change within their immediate social contexts.

Parents' Role in Shaping Youth's Importance Beliefs

How do youth develop their importance beliefs? Researchers posit that parents play a key role in shaping youth's values in both academic and leisure domains (e.g., Eccles, 1993; Harackiewicz, Rozek, Hulleman, & Hyde, 2012; Simpkins et al., 2015). According to the EEVT, there are two psychological mechanisms through which parent-to-youth value transmission happens.

First, youth's importance belief internalization may happen through an indirect cascaded process in which parents' importance beliefs are first consciously perceived and then adopted by youth as their own (Simpkins et al., 2015). For instance, first, youth may perceive that parents believe math is important because parents talk to them about the relevance of math to college admission or job opportunities in STEM related fields. Next, upon reflections on parents' words, youth may decide that math is indeed important for themselves because they do want to go to college or work in STEM related careers. Similarly, in sports, when parents believe that sports is advantageous to their youth's future academic development, they may communicate to their youth the prospect of receiving scholarships and entering prestigious colleges by virtue of sports excellence. Alternatively, parents may discuss with their youth about the benefits of sports to their physical and mental health and their development of interpersonal skills. Through these conversations, youth may consciously realize the benefits of sports to their personal goals, such as academic achievement, physical fitness, or social popularity and adopt their parents' value that sports is important to them as their own. Importantly, since perception-mediated value transmission highly depends on youth's conscious willingness to assimilate what they perceive as their parents' values, its success may be a function of parent-youth relationship quality (e.g., Grolnick, 2003).

Empirically, only a few studies have examined this perception-mediated value transmission, unexceptionally in math (e.g., Gniewosz & Noack, 2012; Lazarides, Rubach, & Ittel, 2017; Rozek et al., 2015). Unfortunately, none of these studies could offer definitive answer because they either used cross-sectional data in parts or all of their mediation analyses (e.g., Gniewosz & Noack, 2012; Rozek et al., 2015), or did not directly measure parents' math importance beliefs but used youth's perceptions of their parents' beliefs as approximations to their parents' beliefs (Lazarides et al., 2017). Therefore, definitive answers to the question of youth's perception-mediated internalization of their parents' values are lacking and require longitudinal studies with direct measures of parents' self-reports of their domain-specific importance beliefs from at least three distinct time points.

In addition to this conscious or perception-mediated value internalization, parents' values can also be directly transmitted to youth without youth's conscious perceptions. This may happen when parents do not explicitly communicate their values to youth but support youth's development in academic or leisure domains with resources such as afterschool programs and extracurricular activities, through which youth independently come to realize that the subject is relevant to their future goals (Simpkins et al., 2015). For instance, when parents support youth's participation in sports behaviorally, youth may come to recognize the advantages of sports to their health, social popularity and scholarship candidacy with information from their teammates and coaches (e.g., Atkins, Johnson, Force, & Petrie, 2015; Bronfenbrenner & Morris, 2006; Greendorfer, 1977). In this way, parents' valuing of sports can lead to youth's beliefs in sports importance without youth's conscious awareness of their parents' values.

Notably, this unconscious value transmission is not mutually exclusive but can be synergistic with conscious or perception-mediated value transmission. For instance, initially, youth might decide to participate in math afterschool programs because their parents told them the benefits of math excellence for their future careers in STEM related fields (i.e., perception-mediated value transmission). Later, as youth became more immersed in math themselves, their beliefs in the value of math might be further enhanced when they noticed improvement in their test scores and eligibility for first rank colleges (i.e., unconscious value transmission). Therefore, youth conscious perception-mediated and unconscious value internalizations of their parents' values can co-exist in a complementary manner.

Tints of Glasses: Projection in Parent-to-Youth Value Transmission

According to the cascaded value internalization process explained above, parents' importance beliefs maybe internalized by youth via their conscious perceptions (e.g., Simpkins et al., 2015). However, what are the sources of youth's perceptions? Is what youth perceive as their parents' math importance beliefs accurate reflections of their parents' actual beliefs?

Projection, first conceptualized by Freud as a defense mechanism to deny undesired personal traits by attributing them to other people, is now commonly interpreted as a "false consensus effect", depicting people's general tendency to assume that others hold the same types of beliefs as themselves (Krueger & Clement, 1994; Quinodoz, 2013; Ross, Greene, & House, 1977). How does projection apply to youth's internalizations of their parents' beliefs about the importance of academic and leisure domains? Specifically, projection in value socialization means that youth may have a false sense of self-other consistency or "mirroring" in their perceptions of their parents' values by equating their parents' beliefs with their own. Therefore, when youth are convinced that a subject (e.g., math, sports or music) is crucial for their educational or occupational developments, they may be biased towards information from their parents that reinforces their conviction of the subject as an indispensible part of their skillset for success. Conversely, when youth themselves believe the subject is irrelevant to their current or future lives, they may selectively pay attention to their parents' behaviors or words that confirm math is only tangential for school or future careers. Therefore, the "tints" of projection can distort youth's visions of parents' attitudes towards certain subject domains as mere reflections of their own existing value judgments.

Despite the potential of this confusion of internal subjective and external objective realities as a general and perhaps inescapable flaw of the "filter" of all people's conceptualizations of the external world, projection may have its strongest influence in childhood and adolescence due to egocentrism. According to Piaget, egocentrism is characterized by the inability to differentiate between the "thoughts" and "beliefs" of other people versus one's own (Elkind, 1967; Enright, Shukla, & Lapsley, 1980). Although youth may have developed the new cognitive capacity to take into account other people's perspectives, they are still limited in their ability to separate their internal subjective realities, mental pre-occupations and attitudes from the external objective realities of other people's actual thoughts and emotions. Importantly, youth's egocentric entanglement of their own beliefs and beliefs of others, such as their parents, is not conscious to youth themselves but a "hidden map" that youth view the world through (Kegan, 1982). Therefore, even though youth may have conscious ideas of and can clearly report on their parents' beliefs of the importance of math, their perceptions of their parents' beliefs may be heavily compromised in accuracy by how much they themselves value math. This is how projection, as an unconscious or subconscious process, may hijack youth's internalizations of parents' beliefs, turning it into a self-reinforcing mechanism of youth's existing beliefs.

Moreover, the external informational ambiguity in parents' very often insufficient communications of their values leaves space for youth's conjecture and may thus, exacerbate projection. Fundamentally, projection is a meaning-making mechanism that happens when one does not fully understand or have full information on other people's thoughts or beliefs, and thus, tries to "fill in the gap" with what one thinks makes sense based on one's own belief systems. Therefore, the degree of projection can be exponentially elevated when objective observable information from other people regarding their thoughts and beliefs, expressed via words and actions, is scarce or self-contradictory (e.g., Swann & Read, 1981). Unfortunately, this low quality of communication seems to affect many parent-to-child value conversations. Researchers discovered that sometimes parents did not have frequent conversations with their youth on their beliefs, sometimes they changed their own beliefs over time, and sometimes, mothers and fathers disagreed in their academic importance beliefs, preventing youth from accurately perceiving them (e.g., Knafo & Schwartz, 2003). Therefore, the muddiness of the messages parents send to youth about their beliefs of the importance in academic and leisure domains can become a breeding ground for youth's projection, which is already developmentally heightened by egocentrism.

Despite the individual and environmental contributors to youth's projection in their internalizations of parents' beliefs of math importance, this process has received little empirical attention. To our knowledge, in the fields of both academic and leisure (i.e., sports and music) value socialization research, no study has systematically tested for projection. However, projection has been confirmed in reflected appraisal research on the perception-mediated transmission of "competency beliefs" from socializers to youth in both math and sports (e.g., Felson, 1985; Felson, 1989). Specifically, reflected appraisal theory posits that the development of one's ideas of one's own competency is influenced by other people's (e.g., parents', teachers', or peers') judgments of oneself, and that this belief internalization process is mediated by one's "reflections" or conscious perceptions of others' judgments. The mechanism of reflected appraisal is thus, almost identical to cascaded or perception-mediated value transmission except for the object of socialization being beliefs of one's competency (i.e., the "expectancy" component of the EEVT) instead of beliefs of the importance of certain subject domains to oneself (i.e., the "value" component of the EEVT). It has been discovered that youth's internalization of their parents' beliefs of their abilities in math and sports is not a direct or unidirectional process, but heavily interrupted by youth's projection of their own self-concept of abilities in these domains in their perceptions of their parents' evaluations of their capabilities (e.g., Felson, 1985; Felson, 1989). Based on the considerable level of theoretical parallel in the fundamental mechanisms of reflected appraisal and perception-mediated value transmission, it is highly likely that projection can also happen in math importance belief socialization. To systematically examine projection in value transmission, longitudinal studies with repeated measures of youth's own values and youth's perceptions of their parents' values, as well as parents' self-reported values are needed.

Youth-Driven Math Importance Belief Socialization

Traditionally, research on value socialization adopted a deterministic and unidirectional perspective, assuming that youth automatically and passively adopt parents' values. Following the reciprocal effects model, researchers began to conceptualize the interactions between parents and youth as a bidirectional reciprocal process that can be both parent- and youth-driven (Barni, Ranieri, Scabini, & Rosnati, 2011; Bell, 1968; Kuczynski & Parkin, 2007; Pinquart & Silbereisen, 2004; Zhang, Haddad, Torres, & Chen, 2011). Therefore, youth's importance belief socialization should be viewed as an interactive and reiterative process where parents not only transmit their values, but can also adapt their own beliefs in response to the youth's beliefs and behaviors (Bronfenbrenner & Morris, 2006; Eccles et al., 1993; Simpkins et al., 2015).

Empirically, youth-to-parent transmission of importance belief in academic and leisure domains has not received enough attention or confirmation. Specifically, youth-driven value transmission has only been discovered in sports via qualitative studies (e.g., Dorsch, Smith, & McDonough, 2009; Dorsch, Smith, & Mcdonough, 2015; Snyder & Purdy, 1982). However, contradicting this finding, quantitative examination of youth-driven socialization in both sports and music yielded insignificant results, showing that youth did not have the power to influence their parents' values in either of these domains (Simpkins et al., 2015). Only two longitudinal studies examined the influence of youth's beliefs on parents' beliefs about math, and neither of the two studies found significant youth-to-parent value transmission. (Lazarides et al., 2017; Simpkins et al., 2015). The 2017 study by Lazarides and colleagues including high school students in Germany measured parents' math importance beliefs with youth's perceptions of parents' beliefs, instead of parents' self-reports. Nevertheless, as mentioned above, youth's perceptions of parents' beliefs might be seriously distorted by their projection especially when parents' communications of their values to youth were insufficient or inconsistent (e.g., Knafo & Schwartz, 2003). In addition, the 2015 study by Simpkins and colleagues including elementary school children in the U.S. did not focus on the transmission of youth's importance beliefs to their parents in particular, but youth's general values including both importance beliefs and interest. Therefore, existing empirical investigations on youth-driven socialization of importance beliefs are lacking. More longitudinal studies with direct measures of both parents' and youth's beliefs are required to disentangle the conundrum of youth-to-parent math importance belief socialization.

Theoretically, we acknowledge the complexity and heterogeneity of value socialization processes and assume that all the aforementioned mechanisms may coexist. For example, both parent- and youth-driven socialization may co-occur and youth's perceptions may serve as both a transmitter of parents' beliefs to youth and an agent of interference and distortion of parents' values due to youth's projection. Therefore, in the current three studies we examined bi-directional socialization of youth's importance beliefs in math, sports and music by parents, taking into account the potential of projection, with specific hypotheses outlined at the beginning each chapter.

CHAPTER 1:

Bidirectional Socialization of Youth's Math Importance Beliefs

Hypotheses

First, regarding parent-driven processes, we hypothesize that parents' math importance beliefs will positively predict changes in youth's own beliefs of math importance (H1.1a) and youth's perceptions of parents' beliefs (H1.1b). In addition, youth's perceptions of parents' beliefs will positively predict changes in youth's own beliefs of math importance (H1.1c). Second, regarding projection, we hypothesize that youth's own math importance beliefs will positively predict changes in their perceptions of parents' math importance beliefs (H1.2). Lastly, regarding youth-driven processes, we hypothesize that youth's own math importance beliefs (H1.3a), as well as youth's perceptions of parents' math importance beliefs will positively predict changes in parents' math importance beliefs (H1.3b). See Figure 1.1 to 1.3 for hypotheses and structural paths correspondences.

Method

Participants and Procedures

Our data came from the first four waves of the longitudinal dataset of the Michigan Study of Adolescent and Adult Life Transitions. We included 1776 youth, 48% female, 94% White, with an average age of 11.6 years from 125 classrooms in 12 middle-income southeastern Michigan school districts. See Table 1.1 for correlation matrix and Table 1.2 for sample descriptives. In each wave, adolescents and parents completed questionnaires in math classrooms and at home respectively. Adolescents' math achievement information was collected from school records.

Measures

Please see Appendix A for complete scale items.

Parents' math importance. Parents' math importance was assessed with one item: "How important is it to you that your child does well in math?" (1= *not at all*, 7= *very important*; Simpkins et al., 2015).

Adolescent perceived parents' math importance. Adolescent perceived parents' math importance was assessed with one item: "How important it is to your parents for you to do well in math" (1= *not at all*, 7= *very important*; Simpkins et al., 2015)

Adolescents' math importance. Adolescents' math importance was assessed with a well-validated 4-item scale (α= .76 - .85; ω= .76 - .85; e.g., "In general, how useful is what you learn in math", 1=*not at all*, 7=*very useful*; Eccles & Wigfield, 1995; Wigfield et al., 1997).

Math achievement. Adolescents' math achievement was measured with their semester math grades.

Prior math achievement. Adolescents' prior math achievement was measured with their 4th grade MEAP math scores and 5th grade annual math GPA. The Michigan Educational Assessment Program (MEAP) is a standardized test administered to all Michigan public school students from elementary to middle school.

Parent-child conflict. Parent-child conflict was assessed with a single item ("My child often argues with me about my rules and decisions for him/her"; 1=*never true*, 7= *always true*).

Demographic covariates. Family socioeconomic status indicators including income and parent education level as well as adolescent characteristics including gender, age and race were included as covariates in all analyses.

Analytical Approach

We examined our hypotheses with measurement invariance tests followed by a modified cross-lagged panel model to disaggregate within-person effects, while controlling for both time-invariant and time-variant covariates. In the following paragraphs we will discuss the procedure of testing measurement invariance, the reason for choosing our structural model and how we used the model to test our hypotheses.

Before our investigations of how our key variables contributed to changes in one another over time, we confirmed our measurement model was measuring the same constructs across waves in the following three steps (Millsap, 2011). First, we tested for weak time invariance, indicated by invariant factor loadings of adolescents' math importance respectively across waves. Second, we tested for strong time invariance, requiring both factor loadings and intercepts of adolescents' math importance to be invariant across waves. In both of these steps, a CFI difference smaller than .01 was interpreted to indicate invariance (Cheung & Rensvold, 2001; Little, 2013). Third, if strong invariance was not achieved, we would test for partial strong invariance sequentially liberating the intercepts that caused the greatest model fit decrease until our model was less than .01 different than the weak invariance model in CFI.

Maintaining the invariance assumptions, we proceeded to examine our structural model using a random-intercept cross-lagged panel model (RI-CLPM) in Mplus (e.g., Hamaker, Kuiper, & Grasman, 2015; Muthén, & Muthén, 2012; see Figure 1.4 for the full RI-CLPM). We chose the RI-CLPM because its disaggregation of within-person reciprocal effects was appropriate for our hypotheses on adolescents' value development. Traditionally, developmental psychologists championed cross-lagged panel models (CLPMs) to test hypotheses about changes of constructs and bidirectional effects (e.g., Lazarides et al., 2017; Simpkins et al., 2015). However, CLPMs are not optimal for studying intrapersonal psychological processes for its aggregation of within-and between-person effects. This is because within- and between-person effects do not always converge, but can drastically differ or even contrast each other (e.g., Hamaker et al., 2015; Curran & Bauer, 2011). Therefore, to assume that the aggregation of the within- and between-person effects can accurately represent within-person processes is a risky assumption guilty of the “ecological inference fallacy”. Therefore, to make sure that we controlled for all interpersonal differences, we decided to adopt the RI-CLPM that disaggregated the within-person effects from the aggregation of between- and within-person effects in traditional CLPMs (Hamaker et al., 2015).

We created our RI-CLPM in the following steps (see Figure 1.4). First, for each key variable, we created a latent intercept to extract individuals’ means for that variable across 4 waves from their original time-specific measures. Thus, what were left in those time-specific measures then became individuals’ time-specific deviations from their personal means in the interested variable. Second, we created residual variables to absorb those time-specific within-person variations by constraining the residual variances of the observed time-specific measures to zero. Then, we regressed those residual variables on one another across constructs, as in the typical CLPM, to study the reciprocal associations amongst these constructs on the within-person level. Moreover, without assuming stationarity, we statistically tested for the equality of the within-person cross-lagged paths and within-wave correlations over time based on chi-square differences between the freely estimated and constrained model. Lastly, we took into account classroom-level nesting using “Type=Complex” and included both time-invariant and time-varying covariates.

In our structural model, comparative fit index (CFI), root mean squared error of approximation (RMSEA), standardized root mean square residual (SRMR) and chi-square (X^2)

were used to assess model fit. Respectively, excellent fit and good fit are indicated by CFI above .95 and between .90 and .95, RMSEA less than .05 and between .05 and .08 and SRMR less than .05 and between .05 and .08 respectively (Millsap, 2011). Missing values were treated with full information maximum likelihood (FIML). We also repeated our analyses using the classic CLPM. Please see Appendix B for the Mplus syntax.

Results

Our measurement model demonstrated partial strong time invariance (see Table 1.3), and our structural model showed good model fit using multiple fit indices: CFI= .961, RMSEA= .024, SRMR= .034, X^2(483, *N*=1776)= 965.10, *p*< .001. See Table 1.1 for correlation matrix, Table 1.4 for path stationarity tests and Table 1.5 and Figure 1.5 for path coefficients.

Parent-Driven Processes

We hypothesized three processes in parent-driven math importance socialization. First, contrary to our prediction (H1.1a), when parents believed math was more important to adolescents, adolescents did not perceive that their parents believed math was more important to them. Second, opposed to our hypothesis (H1.1b), when parents believed math was more important to adolescents, adolescents did not believe that math was more important to themselves. However, supporting our hypothesis (H1.1c), when adolescents perceived that parents believed math was more important to them, they consequentially believed that math was more important to themselves

Projection

Congruent with our hypothesis (H1.2), we discovered that when adolescents believed math was more important to them, they perceived that math was more important to their parents as well.

Youth-Driven Processes

Neither of the two hypothesized youth-driven mechanisms received empirical support. First, incongruent with our prediction (H1.3a), when adolescents believed math was more important to them, parents did not believe math was more important to their adolescents. Second, contradicting our prediction (H1.3b), when adolescents perceived math was more important to their parents, parents did not believe math was more important to their adolescents.

Table 1.1

Correlation Matrix of Observed Variables in Math

		1	2	3	4	5	6	7	8	9
1	W1 Adolescents' IMP-item 1									
2	W1 Adolescents' IMP-item 2	.44***								
3	W1 Adolescents' IMP-item 3	.49***	.46***							
4	W1 Adolescents' IMP-item 4	.40***	.36***	.47***						
5	W2 Adolescents' IMP-item 1	.37***	.26***	.28***	.25***					
6	W2 Adolescents' IMP-item 2	.25***	.34***	.28***	.23***	.53***				
7	W2 Adolescents' IMP-item 3	.31***	.24***	.39***	.31***	.54***	.52***			
8	W2 Adolescents' IMP-item 4	.25***	.21***	.30***	.33***	.43***	.43***	.53***		
9	W3 Adolescents' IMP-item 1	.32***	.24***	.25***	.25***	.35***	.32***	.37***	.31***	
10	W3 Adolescents' IMP-item 2	.24***	.27***	.23***	.19***	.33***	.41***	.32***	.29***	.63***
11	W3 Adolescents' IMP-item 3	.25***	.23***	.29***	.25***	.28***	.29***	.44***	.35***	.64***
12	W3 Adolescents' IMP-item 4	.19***	.17***	.25***	.27***	.26***	.23***	.34***	.41***	.55***
13	W4 Adolescents' IMP-item 1	.22***	.22***	.19***	.20***	.35***	.31***	.32***	.28***	.49***
14	W4 Adolescents' IMP-item 2	.17***	.21***	.16***	.17***	.29***	.34***	.29***	.27***	.41***
15	W4 Adolescents' IMP-item 3	.17***	.19***	.23***	.19***	.27***	.27***	.34***	.32***	.44***
16	W4 Adolescents' IMP-item 4	.17***	.17***	.22***	.26***	.28***	.26***	.32***	.37***	.37***
17	W1 Adolescent perceived parents' IMP	.16***	.15***	.17***	.23***	.17***	.16***	.16***	.24***	.17***
18	W2 Adolescent perceived parents' IMP	.09***	.13***	.12***	.14***	.19***	.22***	.23***	.32***	.19***
19	W3 Adolescent perceived parents' IMP	.11***	.13***	.10***	.18***	.17***	.21***	.18***	.24***	.25***
20	W4 Adolescent perceived parents' IMP	.08**	.08**	.11***	.12***	.15***	.21***	.19***	.22***	.19***
21	W1 Parents' IMP	.07*	0.02	0.04	.10**	.09**	.06*	.08**	.12***	0.06
22	W2 Parents' IMP	0.01	-0.02	0.01	.10**	.07*	0.05	0.04	.09**	.08*
23	W3 Parents' IMP	.09*	0.02	.09**	.18***	.07*	.09**	.11**	.13***	.14***
24	W4 Parents' IMP	0.07	0.05	0.06	.08*	0.04	0.05	0.04	.09**	.09*
25	W1 Math grade	.20***	.10***	.22***	.16***	.17***	.09**	.17***	.21***	.19***
26	W2 Math grade	.18***	.10***	.22***	.16***	.19***	.10***	.21***	.25***	.21***
27	W3 Math grade	.15***	.09***	.17***	.12***	.14***	.08**	.15***	.19***	.24***
28	W4 Math grade	.12***	.08**	.15***	.10***	.12***	.07**	.15***	.19***	.21***

Table 1.1 Continued

		1	2	3	4	5	6	7	8	9
29	Female	0.02	0	-.06**	-0.04	-0.03	-0.03	-.09***	-.05*	0.01
30	Black	0.04	-0.01	0.05	0.03	.06*	0.04	.10***	0.03	0.04
31	Other races	-0.01	0.01	0	-0.01	0	-0.01	-0.02	0.03	0.03
32	Age in years	-.08**	-0.04	-.06**	-.05*	-.05*	-.06**	-.06**	-.06**	-.10***
33	Parent education level	.10**	.08**	.08**	0.04	0.03	0.05	.09**	0.04	.11***
34	Family income	.09**	.07*	.12***	0.04	.09**	0.03	.09**	.07*	.10**
35	Fourth grade MEAP math score	.12***	.08**	.09***	.08**	.09**	0.05	.09***	.06*	.09**
36	Fifth grade math GPA	.16***	.12***	.15***	.13***	.16***	.11***	.15***	.17***	.15***
37	W1 Parent-child conflict	-0.04	-0.05	-0.02	-0.03	-0.04	-0.03	-0.02	-0.02	-0.01
38	W2 Parent-child conflict	-0.06	-0.06	-0.04	-0.02	-0.02	-0.05	-0.01	-0.01	-0.01
39	W3 Parent-child conflict	-0.01	-0.07	-0.05	-0.04	-0.01	0.02	0.03	0.03	0.01
40	W4 Parent-child conflict	-0.03	0.00	-0.01	-0.01	0.03	0.03	0.00	0.00	0.02

Table 1.1 Continued

		10	11	12	13	14	15	16	17	18
11	W3 Adolescents' IMP-item 3	.55***								
12	W3 Adolescents' IMP-item 4	.47***	.57***							
13	W4 Adolescents' IMP-item 1	.43***	.44***	.39***						
14	W4 Adolescents' IMP-item 2	.48***	.35***	.34***	.62***					
15	W4 Adolescents' IMP-item 3	.38***	.48***	.43***	.61***	.56***				
16	W4 Adolescents' IMP-item 4	.33***	.42***	.51***	.58***	.50***	.66***			
17	W1 Adolescent perceived parents' IMP	.14***	.16***	.19***	.16***	.16***	.16***	.21***		
18	W2 Adolescent perceived parents' IMP	.20***	.20***	.23***	.20***	.18***	.21***	.26***	.37***	
19	W3 Adolescent perceived parents' IMP	.25***	.24***	.32***	.30***	.26***	.26***	.33***	.32***	.37***
20	W4 Adolescent perceived parents' IMP	.17***	.18***	.25***	.31***	.27***	.28***	.38***	.25***	.29***
21	W1 Parents' IMP	0.02	0.06	.09**	0.03	0.02	0.05	0.06	.11***	.12***
22	W2 Parents' IMP	0.05	0.07	.10**	.10**	.12**	.10**	.14***	.09**	.13***
23	W3 Parents' IMP	.08*	.12**	.14***	.14***	.11**	.13***	.17***	.15***	.11**
24	W4 Parents' IMP	0.05	.08*	0.05	.13***	.13***	.11**	.13***	.17***	.10**
25	W1 Math grade	.14***	.20***	.16***	.20***	.16***	.24***	.25***	0.04	.08**
26	W2 Math grade	.16***	.23***	.19***	.20***	.13***	.23***	.25***	.07*	.11***
27	W3 Math grade	.20***	.29***	.23***	.22***	.19***	.29***	.29***	.05*	.14***
28	W4 Math grade	.16***	.24***	.22***	.24***	.20***	.32***	.32***	.10***	.14***
29	Female	0.03	-0.05	-0.01	-0.02	-0.01	-0.04	-0.05	-0.03	-.06*
30	Black	0.00	.07*	0.01	0.05	0.05	.06*	0.04	0.04	0.01
31	Other races	0.01	0.03	0.03	.06*	.07*	0.03	0.05	0.03	.06*
32	Age in years	-.07**	-.09***	-.11***	-.09***	-.07*	-.10***	-.11***	-.05*	-.06*
33	Parent education level	.10**	.14***	.09**	.12***	.07*	.11***	.13***	-0.02	0.03
34	Family income	.08**	.13***	.08*	.12***	.08*	.12***	.11***	0.03	0.04
35	Fourth grade MEAP math score	.06*	.07*	.06*	.08**	.07*	.08**	.08**	0.04	0.05
36	Fifth grade math GPA	.13***	.18***	.15***	.15***	.14***	.22***	.22***	0.03	.08**
37	W1 Parent-child conflict	-0.01	0.01	-0.03	0.04	0.01	0.00	-0.02	-0.03	0.01
38	W2 Parent-child conflict	0.01	-0.01	0.00	0.00	-0.01	-0.05	-0.06	-0.02	0.00
39	W3 Parent-child conflict	-0.01	-0.02	-0.02	0.05	0.00	-0.01	-0.01	-0.03	0.00
40	W4 Parent-child conflict	-0.01	-0.04	-0.01	0.06	0.03	-0.02	-0.03	-0.01	0.03

Table 1.1 Continued

		19	20	21	22	23	24	25	26	27
20	W4 Adolescent perceived parents' IMP	.41***								
21	W1 Parents' IMP	.14***	.09**							
22	W2 Parents' IMP	.19***	.13***	.55***						
23	W3 Parents' IMP	.20***	.15***	.57***	.60***					
24	W4 Parents' IMP	.14***	.14***	.53***	.56***	.56***				
25	W1 Math grade	.08**	.17***	0.06	.12**	.13**	.12**			
26	W2 Math grade	.08**	.16***	.09**	.10**	.13**	.12**	.80***		
27	W3 Math grade	.13***	.14***	.08*	.08*	.10**	.08*	.62***	.62***	
28	W4 Math grade	.17***	.16***	.10**	.11**	.10**	.10**	.59***	.60***	.82***
29	Female	0.00	-0.04	0.06	.11**	.07*	.14***	-.12***	-.13***	-.12***
30	Black	0.01	0.00	0.06	0.05	0.04	.12*	-.06*	-0.03	-.06*
31	Other races	0.02	0.02	0.05	0.06	0.02	.16**	0.04	0.05	0.03
32	Age in years	-.10***	-.09***	-.07*	-0.02	-0.06	-0.02	-.19***	-.21***	-.23***
33	Parent education level	0.01	0.06	-0.05	-0.04	-0.03	-0.04	.24***	.31***	.30***
34	Family income	0.04	.13***	-0.04	-0.07	-0.03	-0.01	.30***	.29***	.30***
35	Fourth grade MEAP math score	0.04	.07*	.08*	.11**	0.03	.09*	.45***	.40***	.41***
36	Fifth grade math GPA	.08**	.15***	.07*	.08*	.13***	.08*	.69***	.68***	.65***
37	W1 Parent-child conflict	0.00	-0.03	0.05	0.07	0.07	0.05	-0.05	0.00	-0.04
38	W2 Parent-child conflict	0.02	-0.04	-0.01	0.02	0.08	0.01	-.10*	-0.05	-0.05
39	W3 Parent-child conflict	-0.01	0.00	0.05	0.06	.11*	0.05	-.11**	-.10*	-0.04
40	W4 Parent-child conflict	0.04	-0.06	-0.04	0.07	0.03	0.06	-0.03	-0.04	-0.05

Table 1.1 Continued

		28	29	30	31	32	33	34	35	36
29	Female	-.12***								
30	Black	-.08**	-0.02							
31	Other races	.06*	-0.04	-0.03						
32	Age in years	-.24***	.11***	-0.02	-0.02					
33	Parent education level	.27***	0.00	-0.03	.12***	-.15***				
34	Family income	.29***	0.01	-.09*	0.02	-.11***	.44***			
35	Fourth grade MEAP math score	.40***	-0.03	-.06*	0.03	-.19***	.21***	.13***		
36	Fifth grade math GPA	.63***	-.11***	-.10***	0.05	-.20***	.28***	.27***	.46***	
37	W1 Parent-child conflict	-0.05	0.02	-0.02	0.00	0.00	-.08*	-0.04	-0.05	-0.04
38	W2 Parent-child conflict	-.08*	0.01	-0.01	0.03	-0.03	-0.03	-0.07	-0.04	-.07*
39	W3 Parent-child conflict	-0.04	-0.02	0.02	0.01	-.08*	-0.07	-.11*	-0.05	-0.03
40	W4 Parent-child conflict	-0.03	-0.01	0.04	0.00	0.02	-0.02	-0.06	-0.05	-0.04

Table 1.1 Continued

		37	38	39	40
37	W1 Parent-child conflict				
38	W2 Parent-child conflict	.52***			
39	W3 Parent-child conflict	.46***	.54***		
40	W4 Parent-child conflict	.49***	.48***	.49***	

Note. IMP=importance; W1-4=Wave 1-4.
*p< .05 **p< .01 ***p< .001.

Table 1.2

Descriptive Statistics of Analysis Variables in Math

Indicators	N W1	N W2	N W3	N W4	MEAN(SD) W1	MEAN(SD) W2	MEAN(SD) W3	MEAN(SD) W4
Key variables								
Parents' IMP	1115	815	748	678	6.40(.85)	6.19(.90)	6.31(.85)	6.15(.91)
Adolescent perceived parents' IMP	1754	1729	1551	1551	6.18(1.31)	5.87(1.40)	5.95(1.30)	5.89(1.37)
Adolescents' IMP	1761	1754	1578	1559	5.96(1.02)	5.86(1.09)	5.62(1.20)	5.50(1.29)
Time-invariant covariates								
Prior math achievement								
MEAP math scores	1381				24.39(4.07)***			
Fifth grade math GPA	1507				11.43(2.52)			
Child characteristics								
Female	1776				.48(.50)			
Black	1719				.03(.16)***			
Other races	1719				.03(.18)			
Age in years	1771				11.55(.42)***			
Socioeconomic status								
Parent education level	1156				4.35(1.55)**			
Family annual income	1088				3.64(1.30)			
Time-variant covariates								
Parent-child conflict	1123	810	781	703	2.20(.61)	2.19(.64)	2.20(.62)	2.20(.65)
Math grades	1056	1057	1536	1534	11.93(2.41)***	11.68(2.69)**	10.42(3.24)	9.94(3.42)
Observations	1776							

Note. IMP=importance, W1-4= Wave1-4. European Americans and males are omitted racial and gender groups. Adolescents' math IMP are treated as manifest variables equal to means of factors.

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

Table 1.3

Model Fit Indices in Measurement Invariance Tests in Math

Model	CFI	ΔCFI	RMSEA	SRMR	(df)X^2	(Δdf)ΔX^2
Adolescents' Math IMP						
Unconstrained	.977	.000	.044	.025	(74)330.49***	
Weak time invariance	.973	.004	.045	.037	(83)384.56***	(9)54.08***
Strong time invariance	.936	.037	.065	.063	(95)805.28***	(12)420.72***
Partial strong time invariance	.965	.008	.050	.041	(87)474.38***	(4)89.82***

Note. CFI= comparative fit index; RMSEA= root mean squared error of approximation; SRMR= standardized root mean square residual; IMP=importance. Unconstrained models freely estimated loadings and intercepts over time. Weak time invariance models constrained all loadings to be stable over time but freely estimated intercepts. Strong time invariance models constrained all loadings and intercepts to be stable over time. Partial strong time invariance models constrained all loadings and some intercepts to be stable over time and freely estimated the other intercepts.

$^{***}p < .001$.

Table 1.4

Model Fit Indexes When Path Coefficients Were Estimated Freely and Constrained over in Math

Indicators	$(df)X^2$	CFI	RMSEA	SRMR	(Δdf) TRD
Freely estimated	(456)919.16***	.962	0.962 .024	0.024 .031	0.031
Stationarity constraints					
Cross-lagged paths					
εParents' IMP → εAdolescent perceived parents' IMP	(458)918.11***	.962	.024	.031	(2).41
εParents' IMP → εAdolescents' IMP	(458)920.41***	.962	.024	.031	(2)1.50
εAdolescent perceived parents' IMP → εParents' IMP	(458)920.86***	.962	.024	.031	(2).78
εAdolescent perceived parents' IMP → εAdolescents' IMP	(458)921.31***	.962	.024	.031	(2)2.92
εAdolescents' IMP → εParents' IMP	(458)928.05***	.962	.024	.031	(2)9.43
εAdolescents' IMP → εAdolescent perceived parents' IMP	(458)923.65***	.962	.024	.031	(2)4.44
Stability paths					
εParents' IMP → εParents' IMP	(458)920.83***	.962	.024	.031	(2)2.61
εAdolescent perceived parents' IMP → εAdolescent perceived parents' IMP	(458)918.30***	.962	.024	.031	(2)1.02
εAdolescents' IMP → εAdolescents' IMP	(458)937.88***	.962	.024	.031	(2)24.56***
Within-wave correlations					
εParents' IMP ↔ εAdolescent perceived parents' IMP	.024	.962	.024	.031	(2)3.57
εParents' IMP ↔ εAdolescents' IMP	.024	.962	.024	.031	(2)3.56
εAdolescent perceived parents' IMP ↔ εAdolescents' IMP	.024	.961	.024	.031	(2)13.78
All invariant paths and correlations constrained	(483)965.10***	.961	.024	.034	

Note. ε=residual; IMP=importance; TRD= Sattora-Bentler Scaled Chi-Square Difference. Invariant paths and correlations were those whose constraints did not lead to significant (i.e., $p< .001$) model fit change in stationarity test. Time-invariant covariates including adolescents' gender, age, race, parent education level, family income and prior math achievement were used to predict intercepts and Wave 1-3 residuals of key variables. Time-variant covariates including parent-child conflict and adolescents' math grades were used to predict all 4 waves of residuals of key variables.

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

Table 1.5

Path Coefficients in Math

Indicator			B (SE) Unstd	Std
Fixed effects				
Cross-lagged paths				
Wave 1 to Wave 2				
εParents' IMP	→	εAdolescent perceived parents' IMP	.11(.09)	.05(.04)
εParents' IMP	→	εAdolescents' IMP	.13(.07)	.08(.04)
εAdolescent perceived parents' IMP	→	εParents' IMP	-.02(.02)	-.03(.03)
εAdolescent perceived parents' IMP	→	εAdolescents' IMP	.07(.02)***	.09(.02)***
εAdolescents' IMP	→	εParents' IMP	.04(.04)	.06(.05)
εAdolescents' IMP	→	εAdolescent perceived parents' IMP	.13(.04)**	.09(.03)**
Wave 2 to Wave 3				
εParents' IMP	→	εAdolescent perceived parents' IMP	.11(.09)	.06(.05)
εParents' IMP	→	εAdolescents' IMP	.13(.07)	.07(.04)
εAdolescent perceived parents' IMP	→	εParents' IMP	-.02(.02)	-.04(.04)
εAdolescent perceived parents' IMP	→	εAdolescents' IMP	.07(.02)***	.08(.02)***
εAdolescents' IMP	→	εParents' IMP	.04(.04)	.07(.06)
εAdolescents' IMP	→	εAdolescent perceived parents' IMP	.13(.04)**	.11(.04)**
Wave 3 to Wave 4				
εParents' IMP	→	εAdolescent perceived parents' IMP	.11(.09)	.05(.05)
εParents' IMP	→	εAdolescents' IMP	.13(.07)	.07(.04)
εAdolescent perceived parents' IMP	→	εParents' IMP	-.02(.02)	-.03(.03)
εAdolescent perceived parents' IMP	→	εAdolescents' IMP	.07(.02)***	.08(.02)***
εAdolescents' IMP	→	εParents' IMP	.04(.04)	.08(.07)
εAdolescents' IMP	→	εAdolescent perceived parents' IMP	.13(.04)**	.13(.04)**
Stability paths				
Wave 1 to Wave 2				
εParents' IMP	→	εParents' IMP	.07(.07)	.06(.06)
εAdolescent perceived parents' IMP	→	εAdolescent perceived parents' IMP	.15(.04)***	.14(.03)***
εAdolescents' IMP	→	εAdolescents' IMP	.52(.06)***	.45(.05)***
Wave 2 to Wave 3				
εParents' IMP	→	εParents' IMP	.07(.07)	.07(.07)
εAdolescent perceived parents' IMP	→	εAdolescent perceived parents' IMP	.15(.04)***	.17(.04)***
εAdolescents' IMP	→	εAdolescents' IMP	.52(.06)***	.45(.06)***
Wave 3 to Wave 4				
εParents' IMP	→	εParents' IMP	.07(.07)	.06(.07)
εAdolescent perceived parents' IMP	→	εAdolescent perceived parents' IMP	.15(.04)***	.15(.04)***
εAdolescents' IMP	→	εAdolescents' IMP	.52(.06)***	.52(.06)***

Table 1.5 Continued

Indicator			B (SE) Unstd	Std
Fixed effects				
Within-wave correlations				
Wave 1				
εParents' IMP	↔	εAdolescent perceived parents' IMP	.02(.02)	.04(.03)
εParents' IMP	↔	εAdolescents' IMP	.04(.02)*	.09(.04)*
εAdolescent perceived parents' IMP	↔	εAdolescents' IMP	.22(.03)***	.24(.03)***
Wave 2				
εParents' IMP	↔	εAdolescent perceived parents' IMP	.02(.02)	.03(.03)
εParents' IMP	↔	εAdolescents' IMP	.04(.02)*	.09(.04)*
εAdolescent perceived parents' IMP	↔	εAdolescents' IMP	.22(.03)***	.22(.02)***
Wave 3				
εParents' IMP	↔	εAdolescent perceived parents' IMP	.02(.02)	.04(.04)
εParents' IMP	↔	εAdolescents' IMP	.04(.02)*	.09(.04)*
εAdolescent perceived parents' IMP	↔	εAdolescents' IMP	.22(.03)***	.22(.02)***
Wave 4				
εParents' IMP	↔	εAdolescent perceived parents' IMP	.02(.02)	.03(.03)
εParents' IMP	↔	εAdolescents' IMP	.04(.02)*	.08(.04)*
εAdolescent perceived parents' IMP	↔	εAdolescents' IMP	.22(.03)***	.22(.03)***
Intercept correlations				
INT Parental IMP	↔	INT Adolescent perceived parents' IMP	.12(.03)***	.30(.07)***
INT Parental IMP	↔	INT Adolescent IMP	.03(.03)	.10(.10)
INT Adolescent perceived parents' IMP	↔	INT Adolescent IMP	.15(.04)**	.46(.10)***

Note. ε=residual; IMP=importance; INT= intercept; Unstd=unstandardized; Std=standardized. Fixed effect paths representing the within-person relations amongst key variables. Intercept correlations represent the between-person relations amongst key variables. Time-invariant covariates including adolescents' gender, age, race, parent education level, family income and prior math achievement were used to predict intercepts and Wave 1-3 residuals of key variables. Time-variant covariates including parent-child conflict and adolescents' math grades were used to predict all 4 waves of residuals of key variables.

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

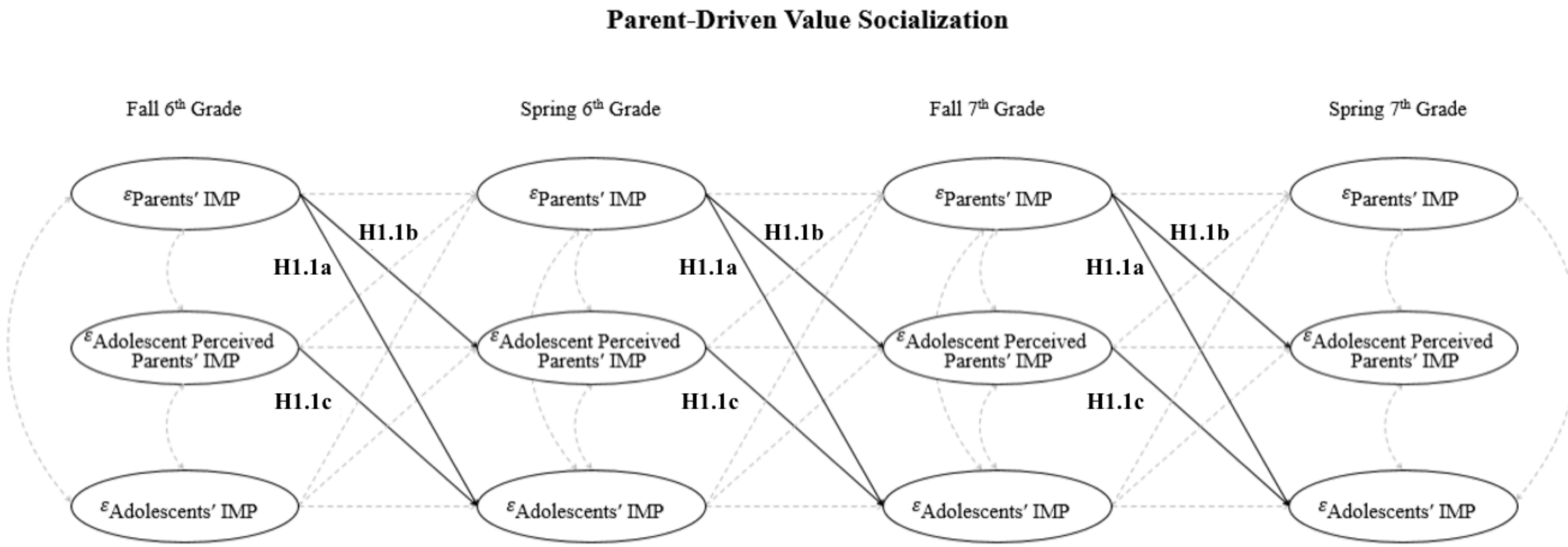

Figure 1.1. Math parent-driven socialization hypotheses H1.1. ε=residual; IMP=importance. See Figure 1.4 for full analysis model.

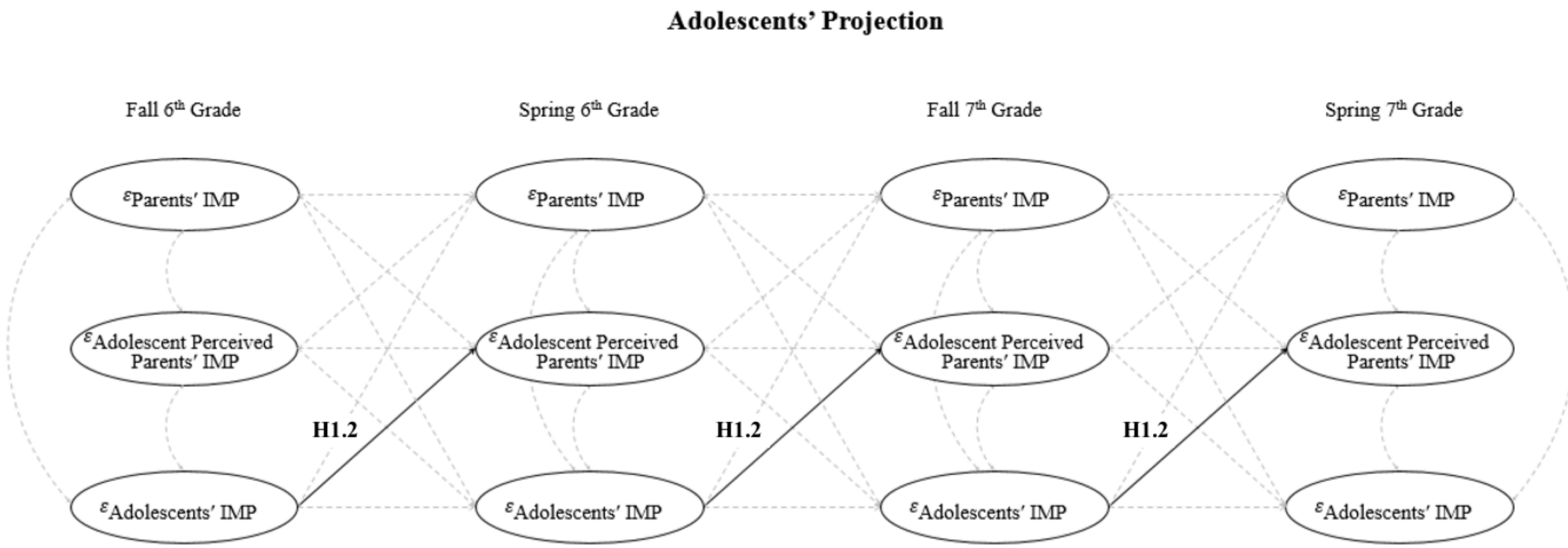

Figure 1.2. Math parent-driven socialization hypotheses H1.2. ε=residual; IMP=importance. See Figure 1.4 for full analysis model.

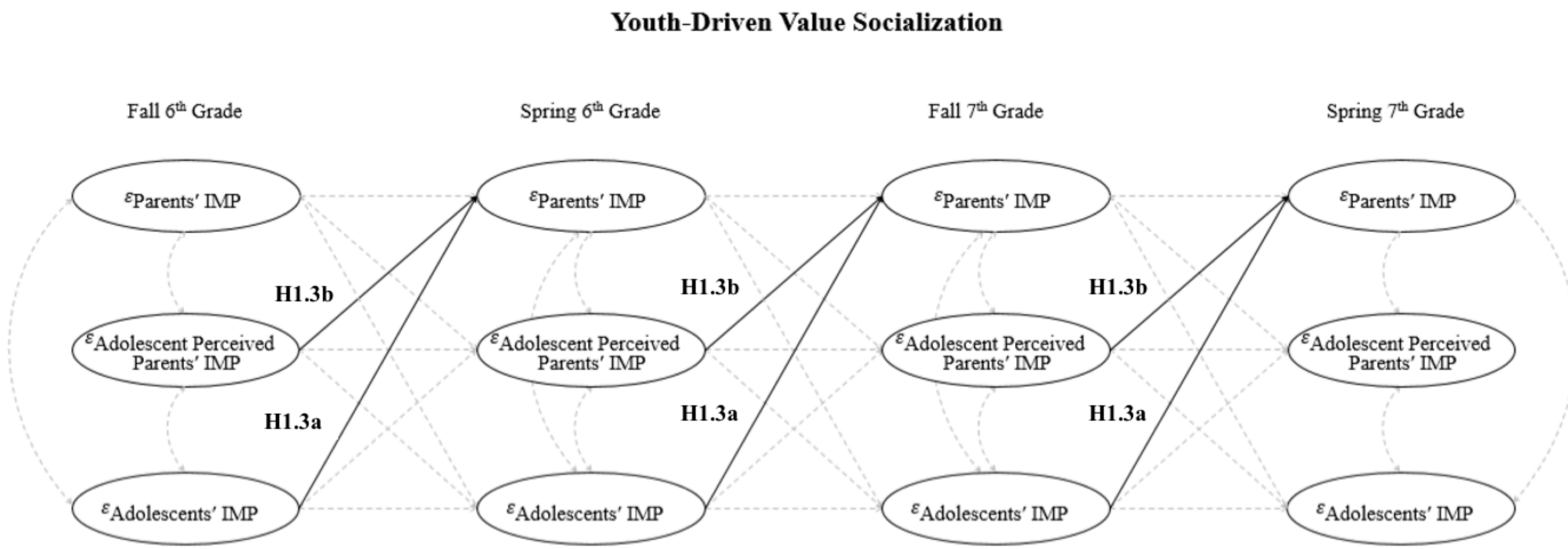

Figure 1.3. Math parent-driven socialization hypotheses H1.3. ε=residual; IMP=importance. See Figure 1.4 for full analysis model.

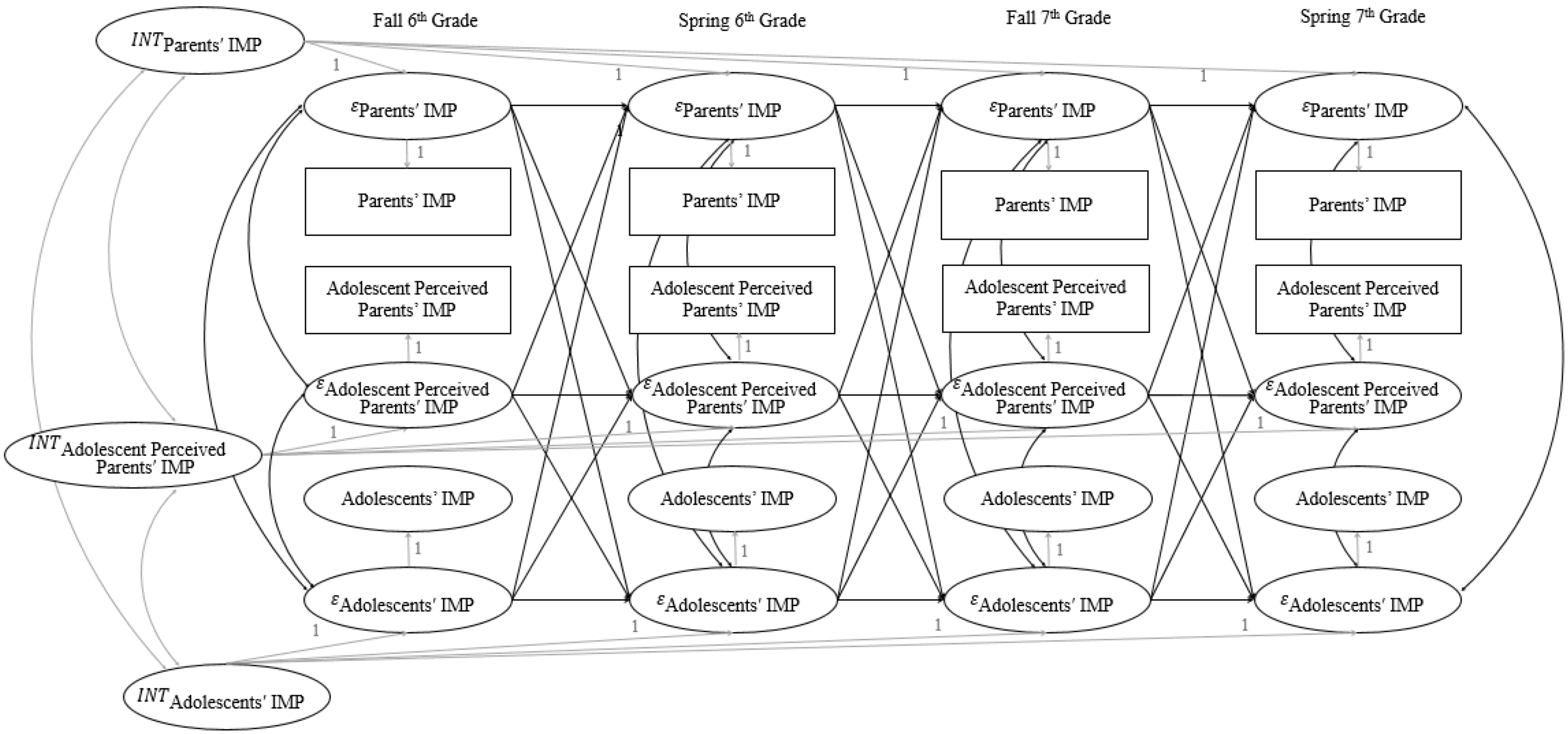

Figure 1.4. Full RI-CLPM in math. ε=residual; IMP=importance; INT=intercept. Latent intercept variable (e.g., "$\text{INT}_{\text{Parents' IMP}}$") represent personal means over time, and latent residual variables (e.g., "$\varepsilon_{\text{Parents' IMP}}$") represent wave-specific deviations from personal means. See Figure 1.1-3 for correspondences between paths and hypotheses. Associations of residual variables, represented by black paths & correlations, indicate within-person relations (see Figure 1.5 and Table 1.5), and grey correlations of "intercepts" represent between-person associations of key variables. Time-invariant covariates including adolescents' gender, age, race, parent education level, family income and prior math achievement predicted intercepts and Wave 1 to 3 residuals of key variables. Time-variant covariates including parent-child conflict and adolescents' math grades predicted all 4 waves of residuals of key variables.

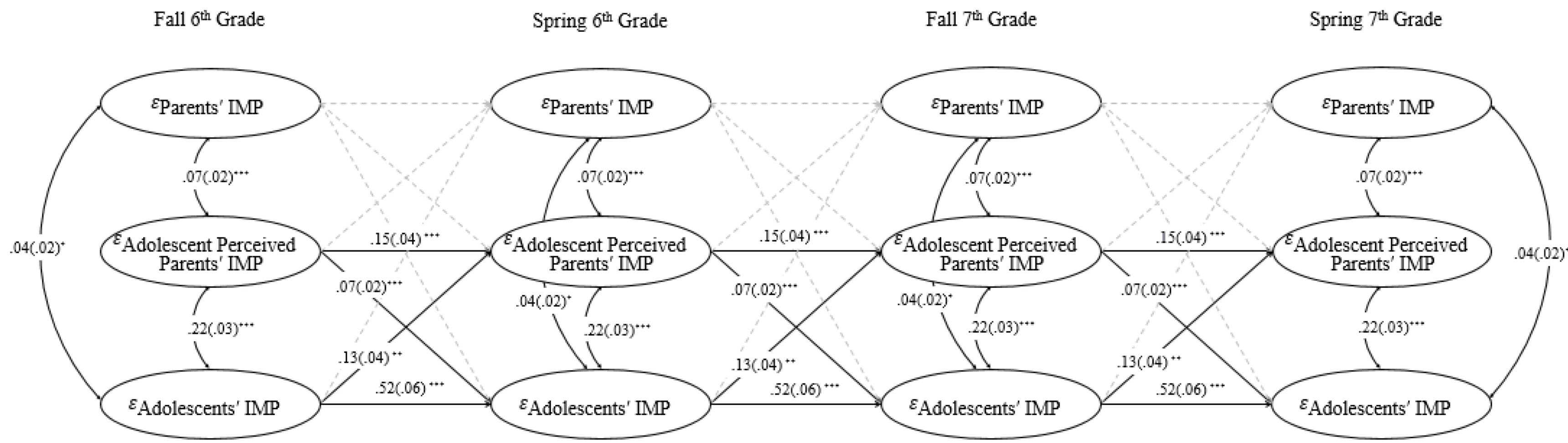

Figure 1.5. Unstandardized path coefficients in math. ε=residual; IMP=importance; INT=intercept. Paths that changed significantly over time were freely estimated; invariant paths were constrained to be equal across waves (see Table 1.4 for stationarity test fit comparisons). Grey dashed lines represent insignificant paths (see Table 1.5). Time-invariant covariates including adolescents' gender, age, race, parent education level, family income and prior math achievement were used to predict intercepts and Wave 1 to 3 residuals of key variables. Time-variant covariates including parent-child conflict and adolescents' math grades were used to predict all 4 waves of residuals of key variables.
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

CHAPTER 2:

Bidirectional Socialization of Youth's Sports Importance Beliefs

Hypotheses

First, regarding parent-driven processes, we hypothesize that parents' sports importance beliefs will positively predict changes in youth's own beliefs of sports importance (H2.1a) and youth's perceptions of parents' beliefs (H2.1b). In addition, youth's perceptions of parents' beliefs will positively predict changes in youth's own beliefs of sports importance (H2.1c). Second, regarding projection, we hypothesize that youth's own sports importance beliefs will positively predict changes in their perceptions of parents' sports importance beliefs (H2.2). Lastly, regarding youth-driven processes, we hypothesize that youth's own sports importance beliefs (H2.3a), as well as youth's perceptions of parents' sports importance beliefs will positively predict changes in parents' sports importance beliefs (H2.3b). See Figure 2.1 to 2.3 for hypotheses and structural paths correspondences.

Method

Participants and Procedures

Our data came from the second to fourth waves of the Childhood and Beyond dataset. We included 907 youth, 50% female with an average age of 9.68 years from 1st, 2nd and 4th grades at Wave 2 drawn from 10 schools in 4 middle-income southeastern Michigan school districts (see Table 2.1 for correlation matrix and 2.2 for sample descriptives). In each wave, data were collected from youth and parents. Youth completed the questionnaires in school and parent questionnaires were mailed to home.

Measures

Parents' sports importance. Parents' sport importance was assessed with one item: "How important is it to you that your child does well in sports?" (1= *not at all*, 7= *very important*; Simpkins et al., 2015).

Youth perceived parents' sports importance. Youth perceived parents' sports importance was assessed with one item: "How important it is to your parents for you to do well in sports" (1= *not at all*, 7= *very important*; Simpkins et al., 2015).

Youth's sports importance. Youth's sports importance was assessed with one item: "For me, being good at sports is" (1= *not at all*, 7= *very important*; Simpkins et al., 2015).

Demographic covariates. Youth's gender and age were included as covariates in all analyses.

Analytical Approach

We tested our hypotheses with a random-intercept cross-lagged panel model (RI-CLPM) to disaggregate within-person effects using Mplus 7.1 (e.g., Hamaker et al., 2015; Muthén, & Muthén, 2007; see Figure 2.4 for the full analysis model). In the following paragraphs we will first discuss our reason for choosing the RI-CLPM over the traditional cross-lagged panel model (CLPM) and then present how we used the RI-CLPM to test our hypotheses.

First, we chose the RI-CLPM over the CLPM because of its disaggregation of within-person reciprocal effects in comparison with the aggregation of between- and within-person effects in the CLPM. Within-person effects are different from between-person effects in that the former correspond to research questions about "intra-individual" relations amongst the interested variables by comparing individuals with themselves, while the latter "inter-individual" relations by comparing individuals with other individuals (e.g., Hamaker et al., 2015). For example, in the context of the current paper, a question on the within-person level is "when youth perceive their parents' value sports more, will they themselves value sports more?" On the contrary, a question on the between-person level is "do youth whose parents value sports more also value sports more themselves?" Conceivably, the first question is more psychological and the second more sociological in nature. However, the traditional CLPM as one the most commonly used methods in developmental psychology for studying bidirectional relations aggregates these two levels of effects, which means that the coefficients produced by a CLPM reflect the sum of both of the within- and between-person effects. This agglomeration may be condonable if the two levels of effects "converge" (i.e., in the same direction) in reality. However, convergence is not guaranteed but depend on the specific variables under study. An erroneous assumption of convergence can easily lead to the "ecological inference fallacy" when we generalize an effect on a between-person level to the within-person level (Curran & Bauer, 2011; Hamaker et al., 2015). In our study, we are specifically interested in the within-person psychological process of value transmission regardless of between-person differences amongst our subjects. Therefore, the RI-CLPM was more suitable to answer our research questions than the traditional CLPM.

Next, we explain how we created our RI-CLPM to answer our research questions. For each key variable, we created a latent intercept variable to represent individuals' means in that variable across 3 waves. After extracting individuals' personal means over time from their original wave-specific measures with the intercept variables, what were left in their wave-specific measures then became individuals' time-specific deviations from their personal means. Then, we created residual variables to absorb those time-specific within-person variations. Lastly, we regressed those residual variables on one another as in the traditional CLPM. The stability and cross-lagged relations amongst those residual variables then represented the associations of our key variables on a within-person level (see Figure 4 for our full analysis model).

Moreover, we tested for the equality of the stability and cross-lagged paths and within-wave correlations across waves. In particular, we compared the chi-square of a freely estimated model and a model in which one specific path or within-wave correlation was constrained to be equal across waves. A chi-square with a p-value less than .001 was taken to indicate invariance and we freely estimated that path or within-wave correlation across waves (e.g., Little, 2013). Alternatively, we constrained the path or within-wave correlation to be equal across waves.

In addition, we accounted for classroom-level nesting and included age and gender as time-invariant covariates to reduce the biases in our estimations. First, we addressed potential non-independence of observations within classrooms with the command "Type=Complex" in Mplus. Second, we included youth's age and gender to predict intercepts and residuals of key variables at Wave 2 as these exogenous variables might contribute to both interpersonal mean-level differences and intrapersonal changes.

We used comparative fit index (CFI), root mean squared error of approximation (RMSEA), standardized root mean square residual (SRMR) and chi-square (X^2) to measure model fit. Good fit is indicated by CFI above .90, RMSEA and SRMR less than .08 (Millsap, 2011). Missing values were treated with full information maximum likelihood (FIML).

Results

Our model demonstrated good model fit: CFI= .972, RMSEA= .042, SRMR= .048, $X^2(21, N=907) = 54.25$, $p < .001$. All paths and within-wave correlations were invariant across waves except for the stability path of youth's sports importance, the cross-lagged path predicting youth's perceptions of parents' sports importance with parents' self-reported sports importance, and the correlation between youth's own sports importance and their perceptions of parents' sports importance (see Table 2.3). See Table 2.1 for correlation matrix and Tables 2.4 and Figure 2.5 for path coefficients.

Parent-driven value socialization. We hypothesized three processes in parent-driven sports importance socialization. First, confirming our hypothesis (H2.1a), when parents believed sports was more important to youth, youth perceived that their parents valued sports more, after controlling for the personal means of parents' and youth's perceptions of parents' sports importance beliefs across waves. Second, concordant with our hypothesis (H2.1b), when parents believed sports was more important to youth, youth in turn believed that sports was more important to themselves, after controlling for the personal means of parents' and youth's sports importance beliefs across waves. Moreover, supporting our hypothesis (H2.1c), when youth perceived that parents believed sports was more important to them, they believed that sports was more important to themselves, after controlling for the personal means of youth's perceptions of parents' sports importance beliefs and their own sports importance beliefs across waves.

Projection. Congruent with our hypothesis (H2.2), we discovered that when youth believed sports was more important to them, they perceived that sports was more important to their parents as well, controlling for the personal means of youth's sports importance beliefs and youth's perceptions of parents' sports importance beliefs across waves.

Youth-driven value socialization. We hypothesized two mechanisms of youth-driven sports importance belief socialization. First, congruent with our prediction (H2.3a), when youth believed sports was more important to them, parents in turn, believed sports was more important to their youth, controlling for the personal means of youth's and parents' sports importance beliefs across waves. However, contradicting our prediction (H2.3b), when youth perceived sports was more important to their parents, parents did not believe sports was more important to their youth, controlling for the personal means of parents' and youth's perceptions of parents' sports importance beliefs across waves.

Table 2.1

Correlation Matrix of Observed Variables in Sports

		1	2	3	4	5	6	7
1	Youth's IMP W2							
2	Youth's IMP W3	.99(.17)***	-					
3	Youth's IMP W4	.93(.16)***	1.64(.18)***	-				
4	Youth Perceived Parent's IMP W2	1.24(.13)***	.88(.18)***	.79(.16)***	-			
5	Youth Perceived Parent's IMP W3	.73(.16)***	2.12(.18)***	1.33(.17)***	.95(.13)***	-		
6	Youth Perceived Parent's IMP W4	.58(.14)***	1.16(.17)***	1.98(.13)***	.86(.14)***	1.52(.19)***	-	
7	Parent's IMP W2	.24(.10)*	.32(.11)**	.42(.11)***	.24(.11)*	.30(.11)**	.35(.09)***	-
8	Parent's IMP W3	.30(.12)**	.60(.15)***	.75(.16)***	.06(.16)	.60(.15)***	.93(.16)***	.58(.10)***
9	Parent's IMP W4	.25(.13)	.71(.15)***	.70(.18)***	.21(.17)	.64(.18)***	.87(.17)***	.47(.13)***
10	Female	-.12(.03)***	-.20(.04)***	-.31(.04)***	-.12(.04)**	-.20(.04)***	-.23(.04)***	-.11(.03)***
11	Age	-.06(.09)	.25(.13)	-.04(.09)	-.19(.10)*	-.06(.09)	-.14(.10)	.02(.08)

Table 2.1 Continued

		8	9	10
9	Parent's IMP W4	1.46(.15)***	-	
10	Female	.30(.11)**	-.14(.05)**	-
11	Age	.15(.09)	-.02(.11)	-.02(.02)

Note. IMP=importance; W2-4=Wave 2-4. Coefficients are unstandardized.
*p< .05 **p< .01 ***p< .001.

Table 2.2

Descriptive Statistics of Analysis Variables in Sports

	N			MEAN(SD)		
Indicators	W2	W3	W4	W2	W3	W4
Parents' IMP	542	266	225	4.24(1.34)	4.20(1.44)	4.42(1.42)
Youth perceived parents' IMP	821	772	700	5.52(1.89)	5.00(1.93)	4.86(1.85)
Youth' IMP	832	778	705	5.72(1.82)	5.48(1.91)	5.07(2.01)
Age (Years)	868			9.68(1.57)		
Female	902			.50(.25)		
Observations	902					

Note. IMP=importance, W2= Wave 2, W3= Wave3, W4= Wave 4.

Table 2.3

Model Fit Indexes When Path Coefficients Were Estimated Freely and Constrained over Time in Sports

Indicators			CFI	RMSEA	SRMR	(df)X^2	(Δdf) TRD
Freely Estimated			.994	.027	.017	(10)16.79	
Stationarity constraints							
Cross-lagged paths							
εParents' IMP	→	εYouth perceived parents' IMP	.986	.041	.026	(11)27.50	(1)27.25***
εYouth's IMP	→	εYouth perceived parents' IMP	.995	.024	.017	(11)16.71	(1).10
εYouth perceived parents' IMP	→	εParents' IMP	.995	.025	.018	(11)17.11	(1).60
εYouth's IMP	→	εParents' IMP	.995	.025	.018	(11)17.32	(1).37
εYouth perceived parents' IMP	→	εYouth's IMP	.996	.022	.017	(11)15.87	(1).01
εParents' IMP	→	εYouth's IMP	.993	.028	.021	(11)18.71	(1)1.97
Stability paths							
εParents' IMP	→	εParents' IMP	.992	.031	.020	(11)20.70	(1)5.62
εYouth perceived parents' IMP	→	εYouth perceived parents' IMP	.993	.028	.019	(11)18.78	(1)1.97
εYouth's IMP	→	εYouth's IMP	.968	.062	.044	(11)48.79	(1)73.61***
Within-wave correlations							
εYouth perceived parents' IMP	↔	εYouth's IMP	.953	.071	.035	(12)67.00	(2)16.23***
εParents' IMP	↔	εYouth's IMP	.993	.028	.020	(12)20.66	(2)3.96
εParents' IMP	↔	εYouth perceived parents' IMP	.993	.028	.020	(12)20.39	(2)3.64
All invariant paths and correlations constrained			.972	.042	.048	(21)54.25***	(11)37.09***

Note. ε=residual; IMP=importance; TRD= Sattora-Bentler Scaled Chi-Square Difference. Invariant paths and correlations were those whose constraints did not lead to significant (i.e., $p< .001$) model fit change in stationarity test. Time-invariant covariates including youth's gender and age were used to predict intercepts and wave 2 residuals of key variables.

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

Table 2.4

Structural Path Coefficients in Sports

Indicator			B(SE) Unstd	Std
Fixed effects				
Cross-lagged paths				
Wave 2 to Wave 3				
εParents' IMP	→	εYouth perceived parents' IMP	.20(.08)*	.16(.06)*
εParents' IMP	→	εYouths' IMP	.14(.07)	.12(.06)*
εYouth perceived parents' IMP	→	εParents' IMP	.03(.06)	.03(.06)
εYouth perceived parents' IMP	→	εYouths' IMP	.13(.06)*	.13(.06)*
εYouths' IMP	→	εParents' IMP	.08(.04)*	.08(.04)*
εYouths' IMP	→	εYouth perceived parents' IMP	.10(.05)*	.10(.05)*
Wave 3 to Wave 4				
εParents' IMP	→	εYouth perceived parents' IMP	.33(.07)***	.33(.07)***
εParents' IMP	→	εYouths' IMP	.14(.07)*	.13(.06)*
εYouth perceived parents' IMP	→	εParents' IMP	.03(.06)	.03(.07)
εYouth perceived parents' IMP	→	εYouths' IMP	.13(.06)*	.13(.06)*
εYouths' IMP	→	εParents' IMP	.08(.04)*	.10(.05)*
εYouths' IMP	→	εYouth perceived parents' IMP	.10(.05)*	.11(.05)*
Stability paths				
Wave 2 to Wave 3				
εParents' IMP	→	εParents' IMP	.58(.06)***	.51(.05)***
εYouth perceived parents' IMP	→	εYouth perceived parents' IMP	.11(.06)	.11(.06)
εYouths' IMP	→	εYouths' IMP	.09(.07)	.09(.07)
Wave 3 to Wave 4				
εParents' IMP	→	εParents' IMP	.58(.06)***	.65(.06)***
εYouth perceived parents' IMP	→	εYouth perceived parents' IMP	.11(.06)	.12(.07)
εYouths' IMP	→	εYouths' IMP	.17(.07)*	.16(.07)
Within-wave covariances				
Wave 2				
εParents' IMP	↔	εYouth perceived parents' IMP	.35(.11)**	.14(.04)**
εParents' IMP	↔	εYouths' IMP	.21(.09)*	.09(.04)*
εYouth perceived parents' IMP	↔	εYouths' IMP	.86(.17)***	.30(.05)***
Wave 3				
εParents' IMP	↔	εYouth perceived parents' IMP	.35(.11)**	.15(.05)**
εParents' IMP	↔	εYouths' IMP	.21(.09)*	.09(.04)*
εYouth perceived parents' IMP	↔	εYouths' IMP	1.54(.18)***	.54(.06)***
Wave 4				
εParents' IMP	↔	εYouth perceived parents' IMP	.35(.11)**	.22(.07)**
εParents' IMP	↔	εYouths' IMP	.21(.09)*	.12(.05)*
εYouth perceived parents' IMP	↔	εYouths' IMP	1.02(.13)***	.42(.05)***
Intercept covariances				
INT Parents' IMP	↔	εYouth perceived parents' IMP	-.19(.15)	na
INT Parents' IMP	↔	INT Youths' IMP	-.04(.13)	na
NT Youth perceived parents' IMP	↔	INT Youths' IMP	.31(.15)*	.57(.18)**

Note. ε=residual; IMP=importance; INT= intercept; Unstd=unstandardized; Std=standardized. Fixed effect paths estimate relations among "residuals" of the key variables on a within-person level, and intercept covariances on a between-person level. Youth's age and gender were included as time invariant covariates.

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

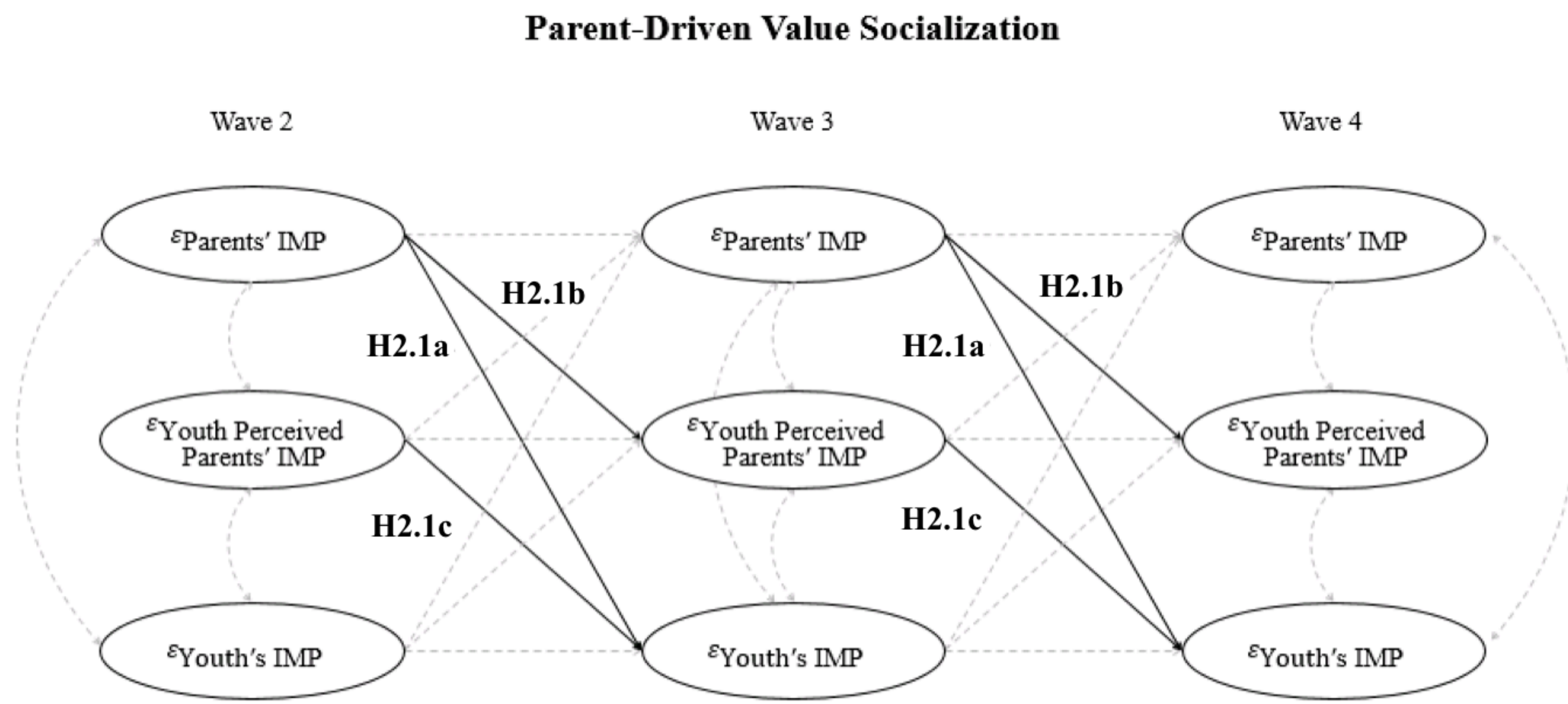

Figure 2.1. Sports youth-driven socialization hypotheses H2.1. ε=residual. See Figure 2.4 for full analysis model.

Youth's Projection

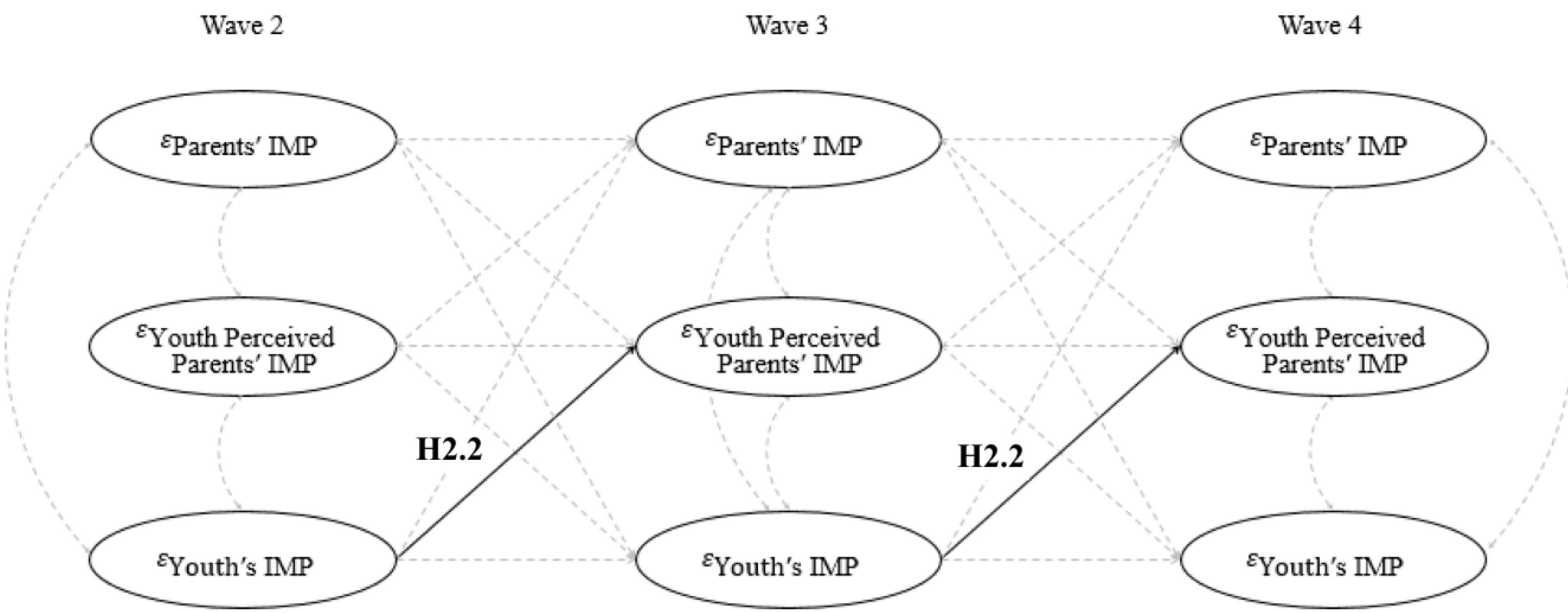

Figure 2.2. Sports youth-driven socialization hypotheses H2.2 ε=residual. See Figure 2.4 for full analysis model.

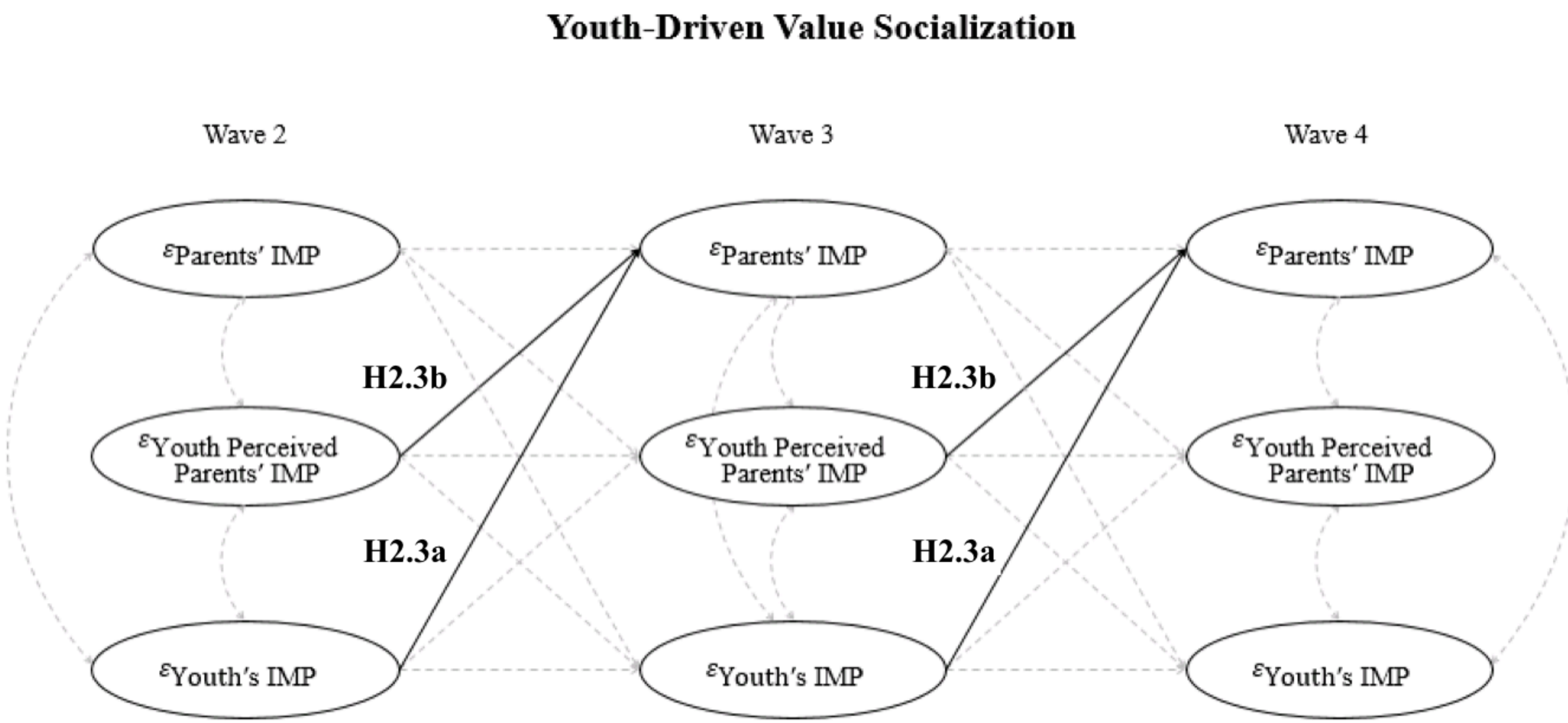

Figure 2.3. Sports youth-driven socialization hypotheses H2.3. ε=residual. See Figure 2.4 for full analysis model.

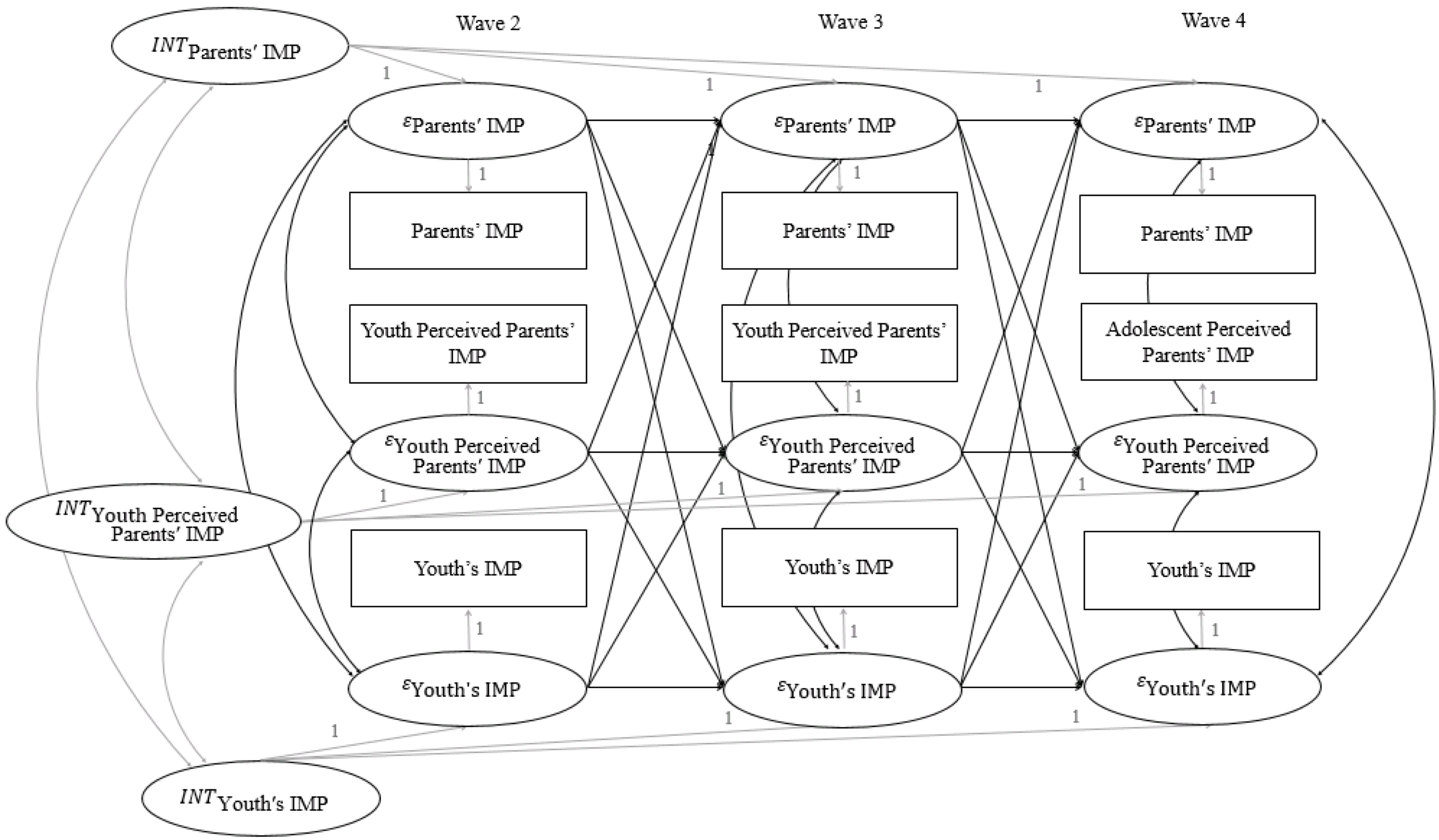

Figure 2.4. Full RI-CLPM in Sports. ε=residual; IMP=importance; INT=intercept. Latent intercept variable (e.g., "$\text{INT}_{\text{Parents' IMP}}$") represent personal means over time, and latent residual variables (e.g., "$\varepsilon_{\text{Parents' IMP}}$") represent wave-specific deviations from personal means. See Figure 2.1-3 for correspondences between paths and hypotheses. Associations of residual variables, represented by black paths & correlations, indicate within-person relations (see Figure 2.5 and Table 2.4 for path coefficients), and grey correlations of "intercepts" represent between-person associations of key variables. Time-invariant covariates including youth's gender and age were used to predict intercepts and Wave 2 residuals of key variables.

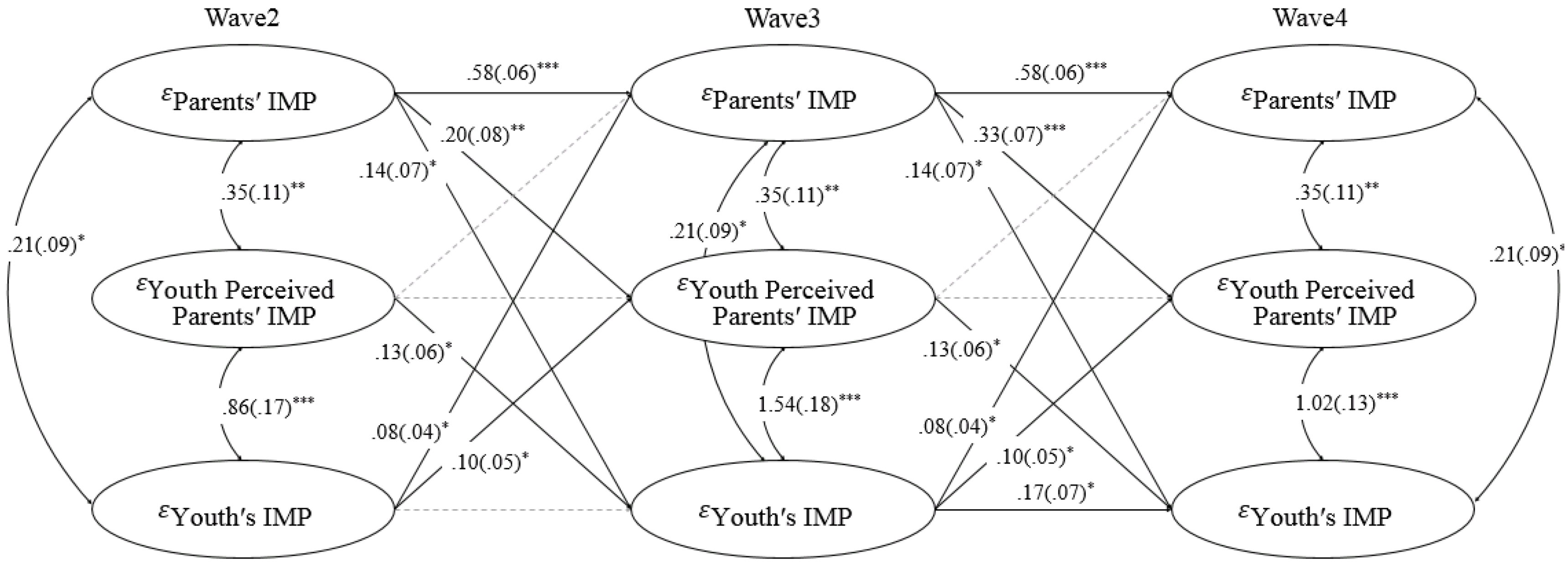

Figure 2.5. Unstandardized path coefficients in sports. ε=residual; IMP=importance; INT=intercept. Paths that changed significantly at p <.001 over time were freely estimated; invariant paths were constrained to be equal across waves (see supplementary materials for stationarity test fit comparisons). Grey dashed lines represent insignificant paths (see Table 2.4 for path coefficients). Time-invariant covariates including youth's gender and age were used to predict intercepts and Wave 2 residuals of key variables.
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

CHAPTER 3:

Bidirectional Socialization of Youth's Music Importance Beliefs

Hypotheses

First, regarding parent-driven processes, we hypothesize that parents' music importance beliefs will positively predict changes in youth's own beliefs of music importance (H3.1). Second, regarding youth-driven processes, we hypothesize that youth's own music importance beliefs will positively predict changes in parents' music importance beliefs (H3.3). See Figure 3.1 to 3.2 for hypotheses and structural paths correspondences[1].

Method

Participants and Procedures

Our data came from the second to fourth waves of the Childhood and Beyond dataset. We included 902 youth, 50% female with an average age of 8.68 years from 1st, 2nd and 4th grades at Wave 2 drawn from 10 schools in 4 middle-income southeastern Michigan school districts (see Table 3.1 for correlation matrix and 3.2 for sample descriptives). In each wave, data were collected from youth and parents. Youth completed the questionnaires in school and parent questionnaires were mailed to home.

Measures

Parents' music importance. Parents' music importance was assessed with one item: "How important is it to you that your child does well in music?" (1= *not at all*, 7= *very important*; Simpkins et al., 2015).

[1] I did not include projection in Chapter 3 because with the inclusion of youth's perceptions, the analytical model would be too complex for the data resulting in compilation failures.

Youth perceived parents' music importance. Youth perceived parents' music importance was assessed with one item: "How important it is to your parents for you to do well in music" (1= *not at all*, 7= *very important*; Simpkins et al., 2015).

Youth's music importance. Youth's music importance was assessed with one item: "For me, being good at music is" (1= *not at all*, 7= *very important*; Simpkins et al., 2015).

Demographic covariates. Youth's gender and age were included as covariates in all analyses.

Analytical Approach

We tested our hypotheses with a random-intercept cross-lagged panel model (RI-CLPM) to disaggregate within-person effects using Mplus 7.1 (e.g., Hamaker et al., 2015; Muthén, & Muthén, 2007; see Figure 3.3 for the full analysis model). We accounted for classroom-level nesting via "Type=Complex" and tested for the equality of the stability and cross-lagged paths and within-wave correlations across waves. We used comparative fit index (CFI), root mean squared error of approximation (RMSEA), standardized root mean square residual (SRMR) and chi-square (X^2) to measure model fit. Good fit is indicated by CFI above .90, RMSEA and SRMR less than .08 (Millsap, 2011). Missing values were treated with full information maximum likelihood (FIML).

Results

Our model demonstrated good model fit: CFI= .951, RMSEA= .043, SRMR= .049, $X^2(14, N=902) = 37.55$, $p < .001$. All paths and within-wave correlations were invariant across waves (see Table 3.3). See Table 3.1 for correlation matrix and Tables 3.4 and Figure 3.4 for path coefficients.

Parent-driven value socialization. Confirming our hypothesis (H3.1), when parents believed music was more important to youth, youth valued music more, after controlling for the personal means of parents' and youth's prior music importance beliefs across waves.

Youth-driven value socialization. Confirming our hypothesis (H3.3), when youth valued music more, parents believed music was more important to youth, after controlling for the personal means of parents' and youth's prior music importance beliefs across waves.

Table 3.1

Correlation Matrix of Observed Variables in Music

		1	2	3	4	5	6	7	8	9
1	Youth's IMP W2									
2	Youth's IMP W3	1.25(.18)***								
3	Youth's IMP W4	1.13(.17)***	1.83(.18)***							
4	Parent's IMP W2	.08(.17)	.18(.15)	-.01(.11)						
5	Parent's IMP W3	.58(.21)**	.72(.20)***	.95(.23)***	.27(.17)					
6	Parent's IMP W4	.26(.24)	.54(.25)	1.34(.22)***	.30(.19)	1.70(.18)***				
7	Age	-.76(.14)***	-.30(.11)**	-.18(.11)	-.10(.07)	.07(.12)	-.10(.12)			
8	Female	.22(.04)***	.26(.04)***	.16(.04)***	-.05(.04)	.14(.05)**	.24(.05)***	-.02(.02)		
9	Income	-.67(.24)**	-.18(.22)	.02(.24)	-.85(.38)*	.21(.28)	.38(.34)	.08(.14)	-.01(.05)	
10	Parent Education	-.39(.14)**	.20(.13)	.26(.14)	.01(.13)	.06(.16)	.52(.18)**	.04(.09)	.04(.03)	1.23(.15)***

Note. IMP=importance; W2-4=Wave 2-4. Coefficients are unstandardized.

*$p < .05$ **$p < .01$ ***$p < .001$.

Table 3.2

Descriptive Statistics of Analysis Variables in Music

	N			MEAN(SD)		
Indicators	W2	W3	W4	W2	W3	W4
Youth' IMP	832	777	689	4.84(2.28)	4.34(2.11)	3.72(2.05)
Parents' IMP	215	263	221	6.02(1.08)	3.88(1.63)	3.86(1.78)
Age (Years)	868			8.68(1.25)		
Female	902			0.5(.50)		
Income	324			4.98(1.81)		
Parent Education	658			5.14(1.57)		
Observations	902					

Note. IMP=importance, W2= Wave 2, W3= Wave3, W4= Wave 4.

Table 3.3

Model Fit Indexes When Path Coefficients Were Estimated Freely and Constrained over Time in Music

Indicators			CFI	RMSEA	SRMR	(df)X^2	(Δdf) TRD
Freely Estimated			.960	.049	.028	(9)28.10***	
Stationarity constraints							
Cross-lagged paths							
εYouth's IMP	→	εParents' IMP	.958	.047	.034	(10)30.28***	(1)2.34
εParents' IMP	→	εYouth's IMP	.947	.053	.029	(10)35.56***	(1)14.00***
Stability paths							
εYouth's IMP	→	εYouth's IMP	.827	.096	.033	(10)93.43***	(1)-1.64
εParents' IMP	→	εParents' IMP	.966	.042	.048	(10)26.25**	(1)1.14
Within-wave correlations							
εParents' IMP	↔	εYouth's IMP	.971	.037	.046	(11)24.92**	(1)1.27
All invariant paths and correlations constrained			.951	.043	.049	(14)37.55***	(5)10.88

Note. ε=residual; IMP=importance; TRD= Sattora-Bentler Scaled Chi-Square Difference. Invariant paths and correlations were those whose constraints did not lead to significant (i.e., $p< .001$) model fit change in stationarity test. Time-invariant covariates including youth's gender and age were used to predict intercepts and wave 2 residuals of key variables.

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

Table 3.4

Structural Path Coefficients in Music

Indicator			B(SE) Unstd	Std
Fixed effects				
Cross-lagged paths				
Wave 2 to Wave 3				
εParents' IMP	→	εYouths' IMP	$.25(.10)^{*}$	$.24(.10)^{*}$
εYouths' IMP	→	εParents' IMP	$.10(.04)^{*}$	$.11(.05)^{*}$
Wave 3 to Wave 4				
εParents' IMP	→	εYouths' IMP	$.43(.09)^{***}$	$.46(.09)^{***}$
εYouths' IMP	→	εParents' IMP	$.10(.04)^{*}$	$.10(.05)^{*}$
Stability paths				
Wave 2 to Wave 3				
εParents' IMP	→	εParents' IMP	$.65(.06)^{***}$	$.59(.07)^{***}$
εYouths' IMP	→	εYouths' IMP	$.13(.06)^{*}$	$.14(.07)^{*}$
Wave 3 to Wave 4				
εParents' IMP	→	εParents' IMP	$.65(.06)^{***}$	$.66(.06)^{***}$
εYouths' IMP	→	εYouths' IMP	$.13(.06)^{*}$	$.13(.06)^{*}$
Within-wave covariances				
Wave 2				
εParents' IMP	↔	εYouths' IMP	$.63(.17)^{***}$	$.23(.05)^{***}$
Wave 3				
εParents' IMP	↔	εYouths' IMP	$.63(.17)^{***}$	$.22(.06)^{***}$
Wave 4				
εParents' IMP	↔	εYouths' IMP	$.63(.17)^{***}$	$.27(.07)^{***}$
Intercept covariances				
INT Parents' IMP	↔	INT Youths' IMP	-.51(.26)	na

Note. ε=residual; IMP=importance; INT= intercept; Unstd=unstandardized; Std=standardized. Fixed effect paths estimate the relations among the "residuals" of the key variables on a within-person level, and intercept covariances on a between-person level. Youth's age, gender & family socioeconomic status were included as time invariant covariates.

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

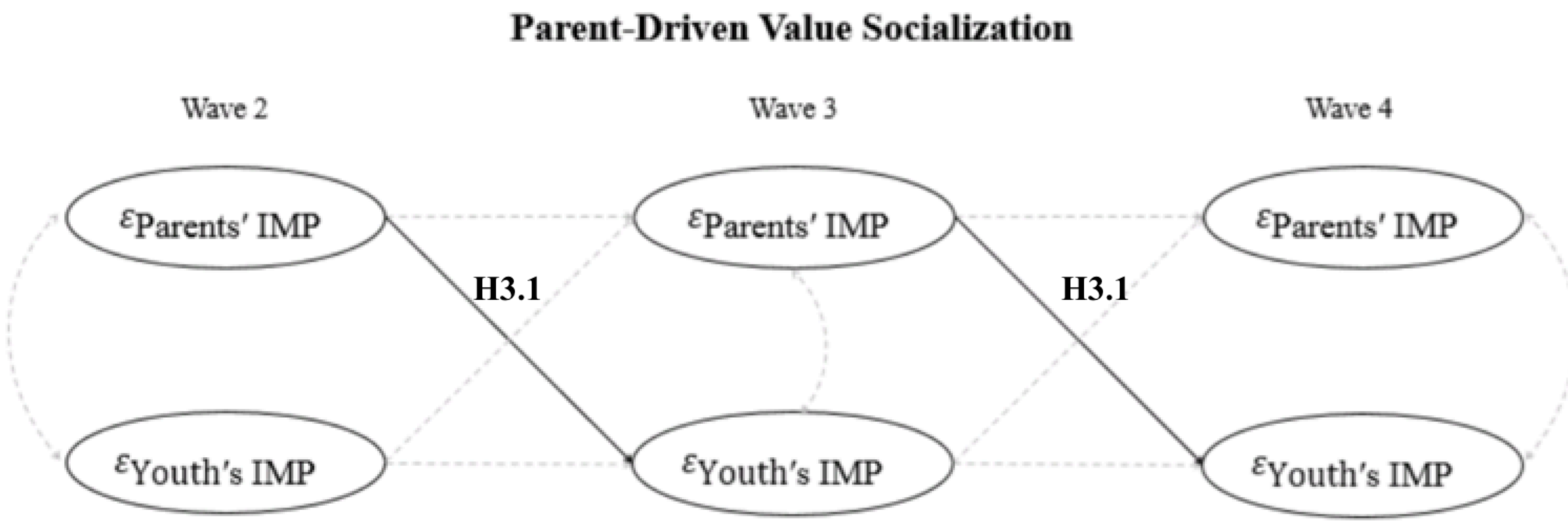

Figure 3.1. Music parent-driven socialization hypothesis H3.1. ε=residual. See Figure 3.3 for full model.

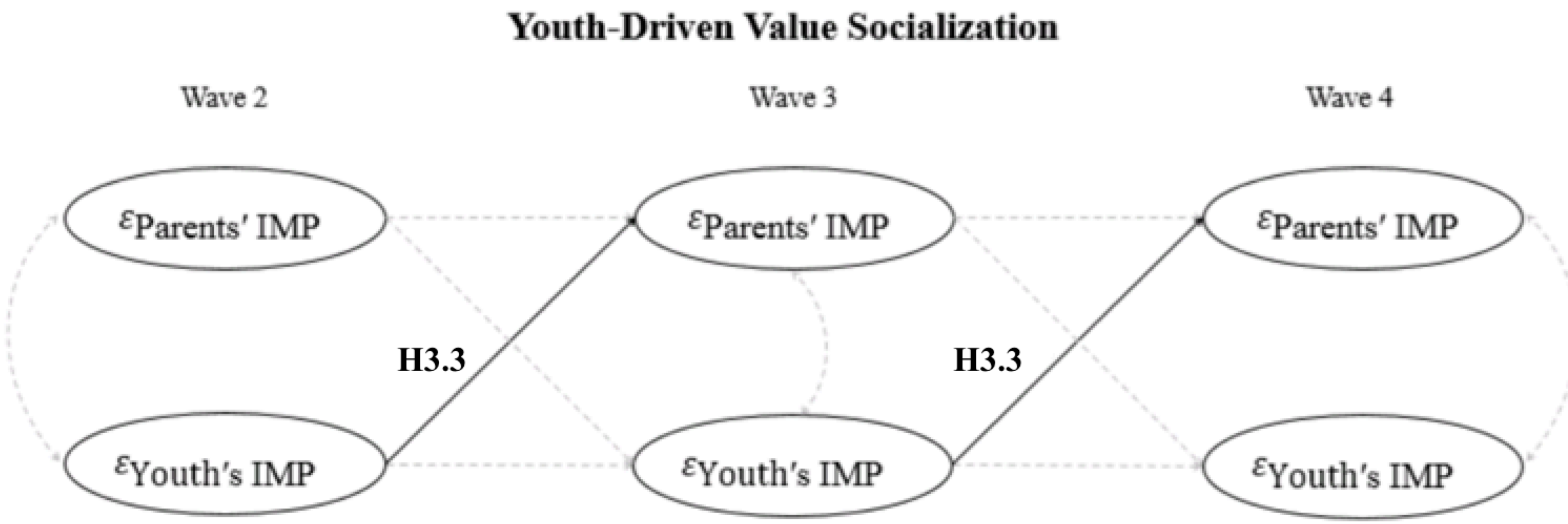

Figure 3.2. Music youth-driven socialization hypothesis H3.3. ε=residual. See Figure 3.3 for full model.

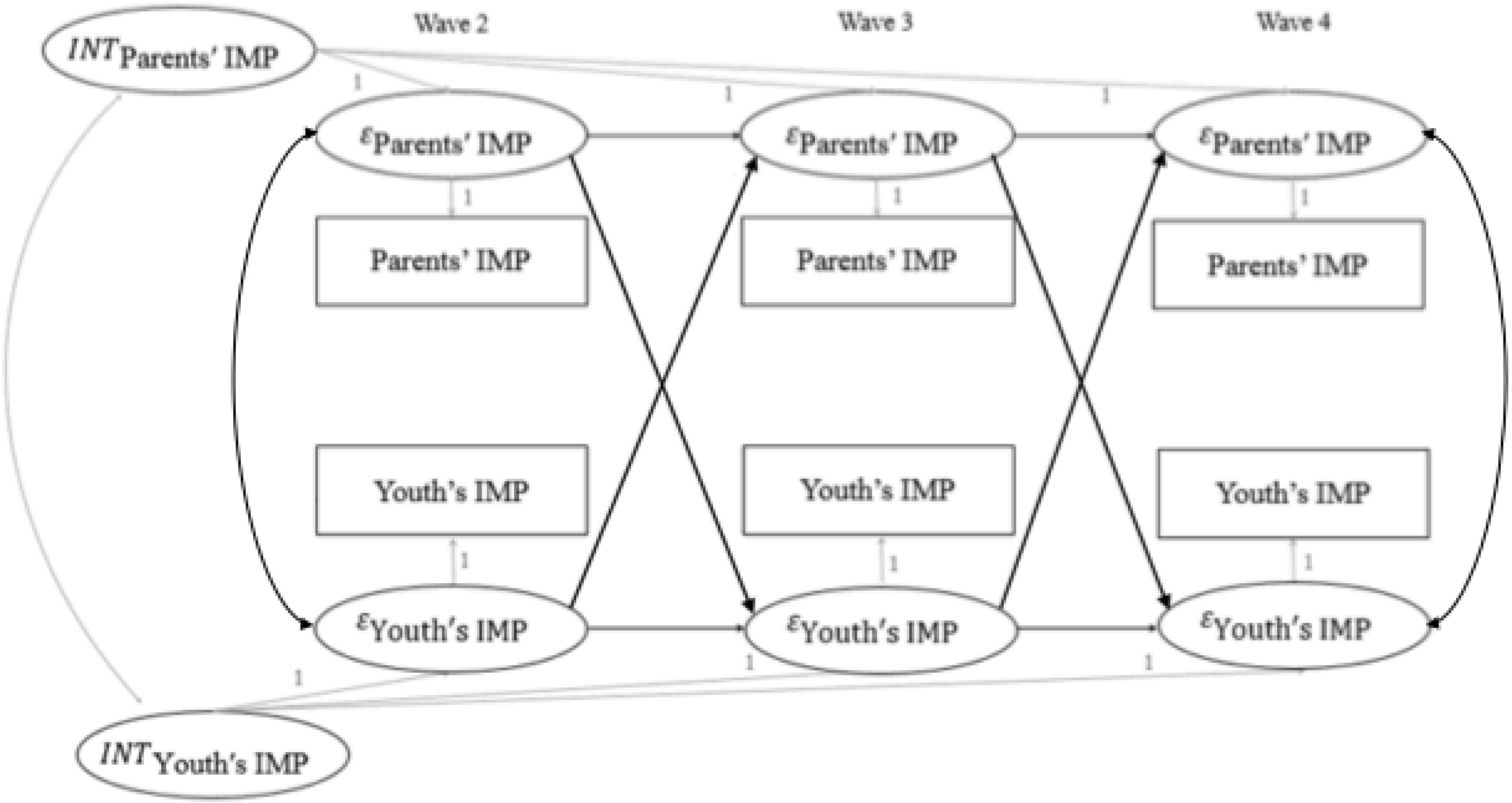

Figure 3.3. Full RI-CLPM in music. ε=residual; IMP=importance; INT=intercept. Latent intercept variable (e.g., "$\text{INT}_{\text{Parents' IMP}}$") represent personal means over time, and latent residual variables (e.g., "$\varepsilon_{\text{Parents' IMP}}$") represent wave-specific deviations from personal means. See Figure 3.1 for correspondences between paths and hypotheses. Associations of residual variables, represented by black paths & correlations, indicate within-person relations (see Figure 3.4 and Table 3.4 for path coefficients), and grey correlations of "intercepts" represent between-person associations of key variables. Time-invariant covariates including youth's gender and age were used to predict intercepts and Wave 2 residuals of key variables.

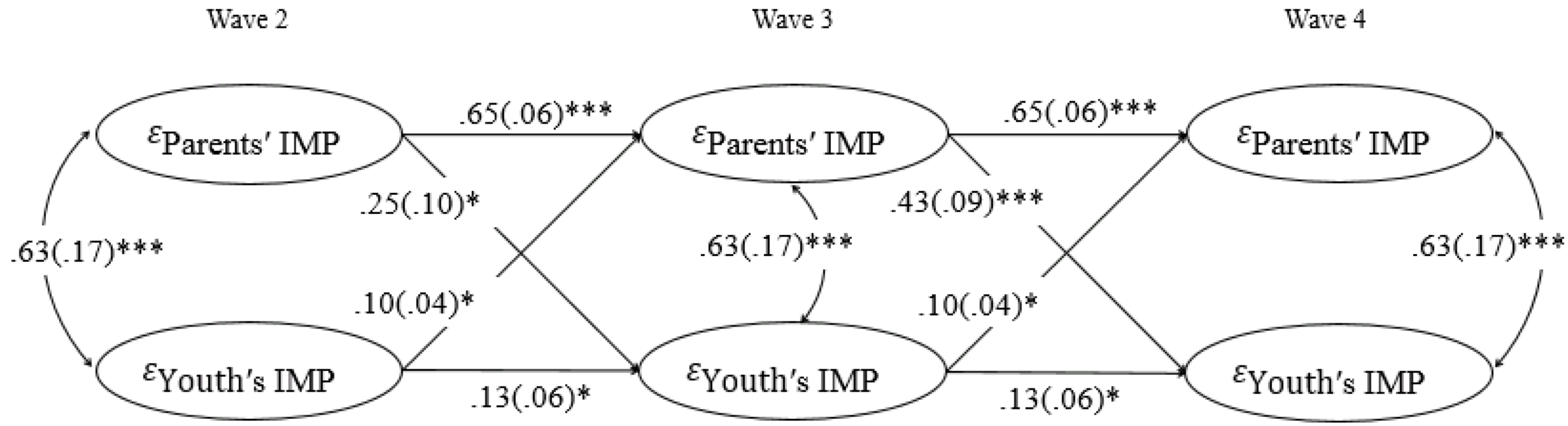

Figure 3.4. Unstandardized path coefficients in music. ε=residual; IMP=importance; INT=intercept. Paths that changed significantly at p <.001 over time were freely estimated; invariant paths were constrained to be equal across waves (see supplementary materials for stationarity test fit comparisons). Grey dashed lines represent insignificant paths (see Table 3.4 for path coefficients). Time-invariant covariates including youth's gender and age were used to predict intercepts and Wave 2 residuals of key variables.
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

DISCUSSION

From the first set of studies that systematically tested for within-person bi-directional perception-mediated importance belief socialization by parents across academic and leisure domains, we had two major findings including the directionality of value socialization by domains and projection.

Directionality of Importance Belief Socialization by Domains

We discovered that the socialization of importance beliefs was unidirectional only from parents to youth in math, but bidirectional as both parent- and youth-driven in sports and music. In the following paragraphs, we will compare both findings with prior research and discuss their implications for future research.

Parent-Driven Socialization. One consensus across all three studies on directionality of value socialization was parents had the power to influence youth's importance beliefs. In particular, in math, although youth's perceptions did not reflect parents' actual values, youth did internalize what they perceived as their parents' math importance beliefs as their own. In sports, youth's perceptions of parents' sports importance beliefs were consistent with parents' actual beliefs, and youth consciously incorporated their perceived parents' values into their own belief system. Lastly, in music, youth readily adopted their parents' beliefs of the importance of music. These results were consistent with the observation of parent-driven socialization in prior empirical studies in both math and sports (e.g., Lazarides et al., 2017; Simpkins et al., 2015; Snyder & Purdy, 1982). Thus, the current studies confirmed the socialization models in the EEVT and the Ecological Systems Theory, demonstrating that youth's values in various domains were developed in the immediate context of their homes, rooted in the beliefs held by their parents (Bronfenbrenner & Morris, 2006; Eccles et al., 1989).

Some logical questions ensue from these findings. First, how do parents communicate their domain-specific importance beliefs to youth? In both the study on math and sports, we discovered that youth's internalization of their parents' values happened through a cascaded process with youth's perceptions of their parents' values as the gatekeeper, consistent with the hypothesis of the EEVT (e.g., Eccles et al., 1989). Since parents' clear communication of their importance beliefs may be pivotal to the socialization of their youth's values, it is necessary to understand the ways in which parents are conveying their values about math, sports and music to youth. For example, in the domain of sports, does the communication occur through discussions of the import of sports to youth's future academic development, physical health, or team spirit and leadership? Is it via parents' sharing of personal histories in sports? Regarding contexts, are these conversations embedded within family sports-related activities such as playing or watching sports? In music, do parents talk with youth about the importance of music to their emotional wellbeing, creativity, character development (e.g., perseverance) or qualifications for scholarships? When and where do these music-related conversations usually happen? Are these talks casual or more formally and seriously structured? Therefore, we call for more in-depth qualitative studies that examine the patterns of conversations between parents and youth on the importance of both academic and leisure domains through interviews or field observations.

Second, will improved frequency and quality of parent-to-youth communication importance predict increase in youth's accurate perceptions of their parents' beliefs? Empirically, there exists no direct evidence demonstrating the quantity and quality of parent-to-youth communications as consequential for value socialization. Some indirect evidence comes from research on math utility value interventions (e.g., Harackiewicz et al., 2012). Researchers discovered that when parents were educated themselves on the usefulness of math to their youth's daily lives, and trained to communicate the values of math to their youth more regularly and effectively, their youth's math utility value increased consequentially (Harackiewicz et al., 2012). Nonetheless, in this study, the intervention manipulated both parents' actual importance beliefs and parent-youth communication, and thus, the increase in youth's sports importance beliefs could not be attributed to improvement in parent-youth communication alone. Therefore, in addition to qualitative interviews and observations on parents' communication of math, sports and music importance to youth, quantitative studies investing the impacts of these conversations on the effectiveness and success of value socialization are needed.

Third, what determines whether youth choose to endorse what they perceive as their parents' values or not? We propose that one contributing factor to this choice is the quality of parent-youth relationship. Specifically, when the relationship between parents and youth is amicable, youth may be more likely to identify with their parents values. On the contrary, when the parent-child relationship is controlling and filled with distress, it may be more likely for youth to embrace a more antagonistic stance against their parents' values (Grolnick, 2003). For example, when parent-youth relationship is rife with conflicts and youth perceive that their parents value music, they may refuse to incorporate their parents' values about music as their own, or rebelliously decrease their existing propensity for music to distance themselves from their parents. In addition, emotional intimacy and harmony between parents and youth may also affect youth's accurate perceptions of parents' values via its impact on the frequency and quality of parent-youth communication. Therefore, parent-youth relationship quality may be a moderator for both perception and internalization in the two-step cascaded perception mediated value transmission.

Another factor that contributes to youth's decision to incorporate their parents' sports values as their own may be the values of alternative socializers. According to the EEVT, parents are not the only socializer in youth's environment. Instead, teachers, coaches and peers also play significant roles in shaping youth's values in various domains (e.g., Eccles et al., 1983). It's unknown how youth integrate these diverse perspectives from their environment especially when they are in conflict with one another. For example, if youth's coaches and peers hold particularly positive perspectives on sports while their parents devalue sports and place central value on academic performance alone, will youth be less inclined to endorse their parents' values as their own? Conversely, when the values of these different socializers converge (e.g., parents, coaches and peers all believe sports is important), will there be a synergy in their effects on youth so that youth will more readily endorse their parents' value? The potential interactions of academic and leisure value socializations by these different socializers may be a worthy topic of research to unveil the highly complex integrative function of youth's psychology in their value development.

Youth-Driven Socialization. We discovered that youth actively influenced their parents' importance beliefs in leisure domains but not in math. Specifically, in both sports and music, our findings supported the bidirectional socialization hypothesis (Barni et al., 2011; Bell, 1968; Kuczynski & Parkin, 2007; Pinquart & Silbereisen, 2004; Zhang et al., 2011), and were consistent with prior qualitative research on youth-driven sports socialization (e.g., Dorsch et al., 2009; Dorsch et al., 2015; Snyder & Purdy, 1982). However, our results contradicted prior quantitative research on socialization of sports and music values between parents and youth that suggested youth did not have any impact of their parents' values (Simpkins et al., 2015). We assumed this discrepancy was a function of at least two factors or two differences between the current and prior studies. First, in the current studies, we isolated sports and music importance beliefs as the foci of bidirectional socialization, while the prior study adopted a more general perspective investigating the bidirectional socialization of general sports and music values. Second, the current studies extracted within-person effects from the aggregation of within- and between-person effects in classic cross-lagged panel models used in prior studies. Despite the presumption of within-person processes in youth's bidirectional value socialization by their parents, reciprocal effect methods that can completely control for all between-person differences were not developed until recently (e.g., Hamaker et al., 2015). Thus, the results of current and prior studies might not be directly comparable since they were based on disparate levels of effects. Nevertheless, regarding math, our findings were consistent with prior empirical evidence of unidirectional value socialization only from parents to youth (e.g., Lazarides et al., 2017; Simpkins et al., 2015). Therefore, the current studies were the first in discovering divergence in directionality of socialization between math and leisure domains.

Why can youth influence their parents' importance beliefs in sports and music but not math? We propose that this distinction may be rooted in parents' beliefs of the unequivocal importance of math, potentially due to its crucial place in college entrance exams. Specifically, regardless of the relevance of math to youth's daily lives outside school, math excellence is an undeniable steppingstone to a good college, and ultimately, many promising and lucrative careers that require a presentable college degree. This assumption of parents' belief of the unquestionable importance of math to adolescents can be partially supported in our study with the high sample mean of parents' math importance beliefs across all 4 waves (see Table 1.2), in contrast with the medium sample means of parents' sports and music importance beliefs across 3 waves (see Table 2.2 & Table 3.2). Therefore, it's possible that our finding of parent-driven unidirectional value socialization in math can be generalized to other subjects within the common core, due to their undeniable centrality in college admission exams. On the contrary, in leisure activities such as music and sports, parents may be more receptive to youth's perspectives regarding their importance. In other words, parents' openness to listening to youth's opinions on the values of different subjects are conditional, potentially depending on the relevance of these subjects to youth's "survival" in a society that places certain types of intelligence above others in judging individuals' competencies and worth.

Another potential explanation for this contrast between our results on math and leisure domains may be age differences. In particular, we included youth from 6th grade in the first wave of our study on math, and a combination of youth from 1st, 2nd and 4th grade in the first waves of our studies on sports and music. The difference in the average ages of youth from the two samples was about 2 years (see Table 1.2, Table 2.2 & Table 3.2). However, youth's growth in autonomy and the consequential shift in family dynamic towards increasing equality between parents and youth may escalate the likelihood of youth-driven value socialization. For example, researchers discovered that parents' respect for their youth's autonomous decision-making continued to increase from age 9 to 20 (Wray-Lake, Crouter, & McHale, 2010). Therefore, it is reasonable to postulate that the direction of youth's value socialization by parents may transform towards mutuality and reciprocity as a function of the accretion of youth's autonomous decision-making power within the household. Future studies should replicate our results in alternative age groups to confirm that the discrepancy in directionality of socialization we observed between math and leisure domains was not due to the age difference between our two samples.

Tinted Glasses: Youth's Projection-Hijacked Value Internalization

From both the studies that tested for projection (i.e., in math and sports), we discovered that value transmission from parents to youth was compromised by projection. Notably, compared with sports, parents' transmission of values in math was not partially interfered with, but completely severed by youth's projection. Specifically, although youth readily internalized what they perceived as their parents' math and sports importance beliefs, unfortunately, youth's perceptions were tainted by their own beliefs instead of accurately reflecting their parents' beliefs. In this way, youth's math and sports importance belief socialization by parents was adulterated and partially or completely reduced to an internal egocentric self-reinforcing mechanism disjointed from parents' actual beliefs due to projection.

Empirically, no prior study had examined projection in the transmission of academic or leisure values, only math and sports competency beliefs (e.g., Felson, 1985). The current studies were the first that systematically tested for and confirmed projection in value transmission. In the following paragraphs, we will discuss potential explanations of this phenomenon along with directions for future research. First, youth's projection could be a product of their developmentally heightened egocentrism. As discussed in the introduction, egocentrism is a fundamental characteristic and inescapable flaw of youth's cognition (e.g., Elkind, 1967). This innate incapability to distinguish one's own beliefs, emotions and attitudes from others may prevent youth from separating their own math importance beliefs from their parents, resulting in perception bias. If we compare youth's perceptions of their parents' math importance beliefs to a mirror, then our results suggest that this "mirror" may be more a reflection of what's inside—youth's own personal beliefs, than what's outside—their parents' actual beliefs. This subjective "tinting" of youth's lens of perception by projection may be an inevitable developmental deficit threatening the accuracy and efficiency of parent-to-youth value transmission. However, since no prior study examined projection in youth's value transmission, replication studies in different age groups are required to confirm that egocentrism is a main contributor to projection. For example, if egocentrism is the major culprit to projection, then adolescents or children younger than participants of the current study (e.g., youth in early or middle elementary school) should experience similar or higher level of projection. Alternatively, older adolescents or young adults (e.g., college students) should demonstrate diminished projection in their perceptions of socializers' values. Therefore, the assumption that projection in value transmission is rooted in egocentrism requires more empirical testing in more diverse developmental phases.

Second, parents' inadequate communications to youth might have exacerbated their projection. Functionally, projection is a form of meaning making that uses one's internal knowledge of one's own beliefs and attitudes to postulate or re-construct the inadequate objective information one receives from other people such as one's parent. Thus, the inaccessibility or ambiguity in external information is the premise of projection (Swann & Read, 1981). In the case of parent-to-youth value socialization, if youth have access to unequivocal and cornucopian information from their parents regarding their beliefs on the value of math and sports, there will be no space left for youth's projection. Therefore, our finding of youth's projection in their value transmission using one of the strictest models for studying reciprocal effects (i.e., RI-CLPM) might indicate a vacuity in youth's conscious awareness of their parents' values that requires additional information to "fill in the gap". Empirically, very few studies have specifically included parent-youth conversations as a predictor of successful parent-to-youth value transmission. Partial evidence exists in the utility-value intervention studies where researchers manipulated both parents' beliefs and the frequency of parents' conversations with youth on the usefulness of math to increase youth's math utility value (e.g., Harackiewicz et al., 2012). However, due to the confounding of parents' elevated beliefs, the improvement in youth's math utility value could not be attributed to ameliorated parent-youth conversations alone. Therefore, further studies are required to confirm if frequent quality conversations with youth on math and sports importance beliefs are pivotal to parents' transmission of their values. This may be achieved via mixed method studies that begin with semi-structured interviews to investigate the crucial components of conversations between parents and youth on the importance of math or sports, followed by quantitative variable-centered analyses to test the relation between these crucial components of communication and the accuracy in youth's perceptions of their parents' values.

Third, youth's desire to please their parents might have aggravated their projection. As stated above, parents' insufficient or ambiguous communications of their beliefs of math importance can create an informational "gap" preventing youth's accurate perceptions of their parents' values. Moreover, youth have the unconscious or subconscious egocentric tendency to utilize their own beliefs as a template to reconstruct their parents' beliefs to "fill in the gap". But what is the driving force that makes youth "want" to "fill in the gap"? According to the Self-Determination Theory (SDT), on an inchoate level of value internalization, youth may work hard in math as passive compliance to their parents to gain affirmation or to avoid punishment (i.e., "introjected regulation"; Cheung & Pomerantz, 2012; Ryan & Deci, 2017). Empirical research suggests that this inherent desire of youth's to meet their parents' expectations is common across different cultures and also a significant predictor of their academic effort and achievement (Cheung & Pomerantz, 2012; Pomerantz, Qin, Wang, & Chen, 2011). Therefore, when youth do not have a clear picture of what their parents actually think, their strong intention to know may propel them to unconsciously create a mental overlay of their own existing values on top of their parents'. In this way, youth's parent-oriented motivation or desire to meet parents' expectations may exacerbate their projection. Future studies should investigate if youth's parent-oriented motivation moderates the projection effect in value transmission.

In conclusion, youth's egocentrism, parents' inadequate communications, and youth's desire to know their parents' opinions may synergistically result in the phenomenon of youth's projection in their perceptions of their parents' beliefs of the importance of math. Further empirical research is required to confirm the existence of projection in different domains, and the potential contributions of these three factors.

Limitations

In the following paragraphs, we will discuss some limitations of these three studies in terms of sample selectivity in age and ethnicity and the use of single-item scales.

Age. We only included youth from 1^{st} to 7^{th} grade in our three studies. However, youth's projection in their perception of parents' values as well as the directionality of value socialization may both change with maturation. For one thing, youth's projection may decrease with age due to the natural alleviation of developmental egocentrism. Egocentrism as a potential natural contributor to youth's projection is pervasive from childhood to adolescence and will only extinguish as a consequence of cognitive maturation (e.g., Elkind, 1967). Therefore, it's reasonable to hypothesize that older adolescents or young adults' assuaged egocentric tendency may mitigate the severity of their projection. Thus, our finding of projection in math and sports importance belief socialization may only apply to young adolescents and children. For another, as discussed before, youth's autonomous power to influence their parents' opinions may continue to multiply with increasingly equal and balanced parent-youth dynamic throughout adolescence (e.g., Wray-Lake et al., 2010). In this way, youth-driven socialization may also become more likely in late adolescence or young adulthood. In conclusion, considering the effects of maturation on both youth's cognitive capacity and the family dynamic, we call for replications of the current studies in more diverse age groups to examine if projection and directionality of value socialization vary as a function of age.

Ethnic homogeneity. Our sample was largely ethnically homogenous with more than 90 percent Caucasian youth and their parents. Nevertheless, race and ethnicity can play a significant role in family conversations and thus, determine both the level of youth's projection and the possibility of youth-to-parent value transmission. To begin with, the extent of youth's projection may be more severe in ethnic cultures with lower average frequencies of conversations between parents and youth. Researchers found that on average, Japanese parents had fewer conversations with their youth compared with American parents (Shearman & Dumlao, 2008). As mentioned previously, youth's projection may be elevated when there is insufficient communication from their parents (e.g., Swann & Read, 1981). Therefore, to the extent that these foreign cultures can be sustained within immigrant families within the U.S., it's reasonable to assume that youth in certain minority groups may experience aggravated projection due to increased limitation in their access to clear messages from their parents. Second, it may be less likely for youth from more authoritarian cultures to influence their parents' values even when they get older. As discussed above, parents may have higher respect for youth's beliefs as youth mature and adopt more autonomy within the family (Wray-Lake et al., 2010). Nonetheless, this potential increase in power for youth may be bridled or nullified by parental authoritarianism in certain ethnic cultures. For instance, researchers discovered that Japanese parents were more likely to be authoritarian than American and Australian parents (Leung, Lau, & Lam, 1998). Additional studies confirmed that in families with authoritarian parents, conversations were more likely to be one-directional from parents to youth only (Maccoby &

Martin, 1983), and that youth were more likely to dissemble or conceal their true feelings and opinions from their parents (Darling, Cumsille, Caldwell, & DoWdy, 2006). Therefore, we hypothesize that in certain minority groups, unidirectional value transmission from parents to youth may be more persistent and stable over time compared with Caucasian families. In sum, ethnic cultural heritages may play a significant role in both youth's projection and their power to influence their parents' values through family conversations and levels of parental authoritarianism. Thus, replications in more ethnically diverse populations are required to examine the cultural specificity of our findings.

Single-item scales. We utilized single-item scales to measure parents' math importance beliefs and youth's perceptions of parents' beliefs. We concede that the reliabilities of these scales could not be directly determined. Nevertheless, we argue that to the extent that reliability is a precondition for validity, our results supported the reliabilities of these two scales. A key indicator of (predictive) validity is whether the scale predicts or is correlated with conceptually relevant variables. In our study, our two key findings were consistent with theoretical predictions and existing empirical evidence. To begin with, our finding of projection in math and sports importance belief socialization was in accordance with the reflected appraisal theory. Specifically, the reflected appraisal theory posits that youth's competency belief socialization by parents goes through a perception-mediated process that can be interposed by projection (e.g., Felson, 1985). We extended the theory to the domain of value socialization and predicted that youth's perceptions of their parents' math and sports importance beliefs could be a product of their own beliefs due to projection. Our results confirmed that projection was an interfering factor in youth's math and sports importance belief socialization by parents in accordance with the reflected appraisal theory. Second, congruent with previous empirical studies on the directionality of math value socialization, we discovered that youth's math importance belief socialization was unidirectional and parent-driven. Specifically, replicating the finding of prior research using traditional CLPMs (Lazarides et al., 2017; Simpkins et al., 2015), our first study adopted a RI-CLPM and confirmed that even on the within-person level, youth's socialization of math importance beliefs was unidirectional rather than reciprocal, solely driven by parents. Therefore, in the absence of direct reliability indicators, the predictive validity of our scales may lend some support to their reliabilities. Future research should replicate our studies with more comprehensive scales for parents' beliefs, youth's perceptions of parents' beliefs and youth's own beliefs of the importance across domains.

CONCLUSION

Drawing from Eccles's Expectancy-Value Theory (e.g., Eccles et al., 1983), we used within-person cross-lagged panel models to examine the bidirectional socialization of youth's math, sports and music importance beliefs by parents. We discovered that youth's internalization of their parents' values was interfered by projection, clouding youth's perceptions of their parents' actual values. Moreover, we found that parents influenced youth's values across domains but youth only influenced parents' values in leisure domains but not in math. Regarding the first finding, we posited three potential causes of youth's projection including developmental egocentrism, parents' inadequate communication of their values and youth's motivation to meet their parents' expectations. Second, regarding directionality of socialization, we discussed three factors that might influence parents' transmission of their values to youth including parent-youth communication quality and frequency, parent-youth relationship quality and the values of alternative socializers. In addition, we postulated that parents' unswayable stance on math importance regardless of their youth's beliefs might be a product of the unequivocal significance of math in college entrance exams. Lastly, we acknowledged the limitations of the current study in sample selectivity and single-item scales and called for future replications using more comprehensive scales and more diverse samples.

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APPENDIX A

See items of parents' beliefs, adolescents' perceptions of parents' beliefs, adolescents' own beliefs of math importance, parent-child conflict and family socioeconomic status below.

Parents' Math Importance

1. How important is it to you that your child does well in math? (1= *not at all important*, 7= *very important)*

Adolescent Perceived Parents' Math Importance

1. How important is it to your parents for you to do well in math? (1= *not at all*, 7= *very important*)

Adolescents' Math Importance (α= .76 - .85; ω= .76 - .85)

1. In general, how useful is what you learn in math? (1= *not at all*, 7= *very useful*)
2. How useful do you think the math you are learning will be for what you want to do after you graduate and go to work? (1= *not at all*, 7= *very useful*)
3. Is the amount of effort it will take to do well in math this year worthwhile to you? (1= *not very worthwhile*, 7= *very worthwhile*)
4. For me, being good at math is... (1= *not at all important*, 7= *very important*)

Parent-child Conflict

1. My child often argues with me about my rules and decisions for him/her (1=*never true*, 7= *always true*)

Socioeconomic Status

Mother Education Level. What is the highest level of education you have received? (1= *grade school*, 9= *Ph.D. or professional degree*)

Family Income. What is your average yearly family income? (1= *under $10,000*, 5= *over $40,000*)

APPENDIX B

Mplus Syntax for RI-CLPM Using FIML in Math

```
  Data:
     File is PerceptionBiasW1-4.dat;

 Variable:
  Names are
    v1067 v1068 v1069 v1072 v1073 v1232 v1233 v1236 v1237 v1241 PPV1 v3564
    v3565 v3566 v3569 v3570 v3730 v3740 v3741 v3745 v3746 PPV2 v5162 v5163
    v5164 v5166 v5167 v5180 v5181 v5182 v5183 v5309 PPV3 PV1 v2018 PV2
    v4020 PV3 v6079 dfemale v3867 v3873 v1658 v9607 v7638 v7639 v7642
    v7643 v7628 PPV4 v7461 v7462 v7463 v7466 v7467 PV4 v6549 gpa1 gpa2
    gpa3 gpa4 classroomID v2109 v2111 v2113 v2115 v4123 v4125 v4127 v4129
    v6122 v6124 v6126 v6128 v6652 v6654 v6656 v6658 v2108 v2110 v2112
    v4122 v4124 v4126 v6121 v6123 v6125 v6651 v6653 v6655 v1256 v1258
    v1259 v1260 v3796 v3798 v3799 v3800 v5331 v5333 v5334 v5335 v7701
    v7703 v7704 v7705 v2049 v4051 v6090 v6572 v1655 v9628 v9631 v9634
    v9638 v9641 black other white ageYr parentEd income;


     usevar=v1067 v1068 v1069 v1072 !wave 1 sv=adolescents' math importance
          v3564 v3565 v3566 v3569 !wave 2 sv
          v5164 v5162 v5163 v5166 !wave 3 SV
          v7461 v7462 v7463 v7466 !wave 4 sv
          PPV1 !wave 1 ppv=adolescent perceived parents' importance
          PPV2 !wave 2 ppv
          PPV3 !wave 3 ppv
          PPV4 !wave 4 ppv
          PV1 !wave 1 pv=parents' importance
          PV2 !wave 2 pv
          PV3 !wave 3 pv
          PV4 !wave 4 pv
          gpa1 !wave 1 gpa=math grade
          gpa2 !wave 2 math grade
          gpa3 !wave 3 math grade
          gpa4 !wave 4 math grade
          dfemale black other ageYr parentEd income
          v1658 v9607 !aptitude: 4th grade MEAP & 5th grade GPA

     !parent-child conflict
     v2115 v4129 v6128 v6658;!w1-4

     Cluster=classroomID;
```

```
   Missing are all (-99);

Analysis:
    Estimator=MLR;
    model=nocovariances;
    ITERATIONS=500000;
    TYPE=COMPLEX;

Model:
  !measurement model:
  !Latent variable math sv
      SV1 by v1069@1
      v1067(1)
      v1068(2)
      v1072(3);

      SV2 by v3566@1
      v3564(1)
      v3565(2)
      v3569(3);

      SV3 by v5163@1
      v5164(1)
      v5162(2)
      v5166(3);

      SV4 by v7463@1
      v7462(1)
      v7461(2)
      v7466(3);

      [v1068 v3565](B1);
      [v5162];
      [v7461];
      [v1067](B2);
      [v7462];
      [v3564];
      [v5164];
      [v1069 v3566 v5163 v7463](B3);
      [v3569](B4);
      [v5166];
      [v7466];
      [v1072];

  !residual variances (all free)
  v1068;
```

```
v1067;
v1069;
v1072;
v3565;
v3564;
v3566;
v3569;
v5162;
v5164;
v5163;
v5166;
v7461;
v7462;
v7463;
v7466;
! Residual covariance
   v1068 with v3565;
   v1068 with v5162;
   v3565 with v5162;
   v1068 with v7461;
   v3565 with v7461;
   v5162 with v7461;

   v1067 with v3564;
   v1067 with v5164;
   v3564 with v5164;
   v1067 with v7462;
   v3564 with v7462;
   v5164 with v7462;

   v1069 with v3566;
   v1069 with v5163;
   v3566 with v5163;
   v1069 with v7463;
   v3566 with v7463;
   v5163 with v7463;

   v1072 with v3569;
   v1072 with v5166;
   v3569 with v5166;
   v1072 with v7466;
   v3569 with v7466;
   v5166 with v7466;

 !mention variance of control variables to avoid listwise deletion
 [parentEd];
```

```
    [income];
    [ageYr];
    [dfemale];
    [black];
    [other];
    [v1658];!4th grade meap
    [v9607];!5th grade gpa

!structural model:

  !create intercepts
  eta_PPV by PPV1@1 PPV2@1 PPV3@1 PPV4@1;
  eta_PV by PV1@1 PV2@1 PV3@1 PV4@1;
  eta_SV by SV1@1 SV2@1 SV3@1 SV4@1;

  !constrain observed intercepts & latent means to identify residual means/intercepts
  ![PPV1@0];
  ![PPV2@0];
  ![PPV3@0];
  ![PPV4@0];

  ![PV1@0];
  ![PV2@0];
  ![PV3@0];
  ![PV4@0];

  ![SV1@0];
  ![SV2@0];
  ![SV3@0];
  ![SV4@0];

  ![gpa1@0];
  ![gpa2@0];
  ![gpa3@0];
  ![gpa4@0];


  !constrain observed residual variances to identify structured residuals
  PPV1@0;
  PPV2@0;
  PPV3@0;
  PPV4@0;

  PV1@0;
  PV2@0;
  PV3@0;
```

```
PV4@0;

SV1@0;
SV2@0;
SV3@0;
SV4@0;


!estimate structured residuals
l_PPV1 by PPV1@1;
l_PPV2 by PPV2@1;
l_PPV3 by PPV3@1;
l_PPV4 by PPV4@1;

l_PV1 by PV1@1;
l_PV2 by PV2@1;
l_PV3 by PV3@1;
l_PV4 by PV4@1;

l_SV1 by SV1@1;
l_SV2 by SV2@1;
l_SV3 by SV3@1;
l_SV4 by SV4@1;


!here all "residuals of residuals" are freely estimated
l_PPV1;
l_PPV2;
l_PPV3;
l_PPV4;

l_PV1;
l_PV2;
l_PV3;
l_PV4;

l_SV1;
l_SV2;
l_SV3;
l_SV4;

!AR amoungst SR's WITHOUT assumed stationarity
l_PPV2 on l_PPV1(C1);
l_PPV3 on l_PPV2(C1);
l_PPV4 on l_PPV3(C1);
```

```
l_PV2 on l_PV1(C2);
l_PV3 on l_PV2(C2);
l_PV4 on l_PV3(C2);

l_SV2 on l_SV1(C3);
l_SV3 on l_SV2(C3);
l_SV4 on l_SV3(C3);


!cross-lagged paths

  !wave1-2
    l_PPV2 on l_PV1(C4);
    l_PPV2 on l_SV1(C5);

    l_PV2 on l_PPV1(C6);
    l_PV2 on l_SV1(C7);

    l_SV2 on l_PPV1(C8);
    l_SV2 on l_PV1(C9);

  !wave2-3
    l_PPV3 on l_PV2(C4);
    l_PPV3 on l_SV2(C5);

    l_PV3 on l_PPV2(C6);
    l_PV3 on l_SV2(C7);

    l_SV3 on l_PPV2(C8);
    l_SV3 on l_PV2(C9);

  !wave3-4
    l_PPV4 on l_PV3(C4);
    l_PPV4 on l_SV3(C5);

    l_PV4 on l_PPV3(C6);
    l_PV4 on l_SV3(C7);

    l_SV4 on l_PPV3(C8);
    l_SV4 on l_PV3(C9);


 !step2: controls

    !time-invariant controls
    !part 1: predicting intercepts & wave 1 residual variables
```

```
eta_PPV on dfemale v1658 v9607 black other ageYr parentEd income;
eta_PV on dfemale v1658 v9607 black other ageYr parentEd income;
eta_SV on dfemale v1658 v9607 black other ageYr parentEd income;

l_PPV1 on dfemale v1658 v9607 black other ageYr parentEd income;
l_PV1 on dfemale v1658 v9607 black other ageYr parentEd income;
l_SV1 on dfemale v1658 v9607 black other ageYr parentEd income;

l_PPV2 on dfemale v1658 v9607 black other ageYr parentEd income;
l_PV2 on dfemale v1658 v9607 black other ageYr parentEd income;
l_SV2 on dfemale v1658 v9607 black other ageYr parentEd income;

l_PPV3 on dfemale v1658 v9607 black other ageYr parentEd income;
l_PV3 on dfemale v1658 v9607 black other ageYr parentEd income;
l_SV3 on dfemale v1658 v9607 black other ageYr parentEd income;

!part 2: correlations amongst time invariant controls
   dfemale with v1658;
   v1658 with v9607;
   v9607 with black;
   black with other;
   other with ageYr;
   ageYr with parentEd;
   parentEd with income;
   dfemale with v9607;
   v1658 with black;
   v9607 with other;
   black with ageYr;
   other with parentEd;
   ageYr with income;
   dfemale with black;
   v1658 with other;
   v9607 with ageYr;
   black with parentEd;
   dfemale with other;
   v1658 with ageYr;
   v9607 with parentEd;
   other with income;
   black with income;
   dfemale with ageYr;
   v1658 with parentEd;
   v9607 with income;
   dfemale with parentEd;
   v1658 with income;
   dfemale with income;
!time-variant controls
```

```
!part 1: predicting key varibles
l_PPV1 on v2115 gpa1;
l_PPV2 on v2115 v4129 gpa1 gpa2;
l_PPV3 on v4129 v6128 gpa2 gpa3;
l_PPV4 on v6128 v6658 gpa3 gpa4;

l_PV1 on v2115 gpa1;
l_PV2 on v2115 v4129 gpa1 gpa2;
l_PV3 on v4129 v6128 gpa2 gpa3;
l_PV4 on v6128 v6658 gpa3 gpa4;

l_SV1 on v2115 gpa1;
l_SV2 on v2115 v4129 gpa1 gpa2;
l_SV3 on v4129 v6128 gpa2 gpa3;
l_SV4 on v6128 v6658 gpa3 gpa4;

!part 2: correlations
   !a> within constructs
   v2115  with v4129;
   v2115  with v6128;
   v2115  with v6658;
   v4129  with v6128;
   v4129  with v6658;
   v6128  with v6658;!conflict

   gpa1 with gpa2;
   gpa1 with gpa3;
   gpa1 with gpa4;
   gpa2 with gpa3;
   gpa2 with gpa4;
   gpa3 with gpa4;

   !b> between constructs
   v2115 with gpa1 gpa2;
   v4129 with gpa1 gpa2 gpa3;
   v6128 with gpa2 gpa3 gpa4;
   v6658 with gpa3 gpa4;

   !c> with time invariant controls
   gpa1 with dfemale v1658 v9607 black other ageYr parentEd income;
   gpa2 with dfemale v1658 v9607 black other ageYr parentEd income;
   gpa3 with dfemale v1658 v9607 black other ageYr parentEd income;
   gpa4 with dfemale v1658 v9607 black other ageYr parentEd income;

   v2115 with dfemale v1658 v9607 black other ageYr parentEd income;
   v4129 with dfemale v1658 v9607 black other ageYr parentEd income;
```

```
        v6128 with dfemale v1658 v9607 black other ageYr parentEd income;
        v6658 with dfemale v1658 v9607 black other ageYr parentEd income;

  !estimate within-wave residual covariances of SRs (within-person level)

      l_SV1 WITH l_PPV1(C10);
      l_SV1 WITH l_PV1(C11);
      l_PPV1 WITH l_PV1(C12);

      l_SV2 WITH l_PPV2(C10);
      l_SV2 WITH l_PV2(C11);
      l_PPV2 WITH l_PV2(C12);

      l_SV3 WITH l_PPV3(C10);
      l_SV3 WITH l_PV3(C11);
      l_PPV3 WITH l_PV3(C12);

      l_SV4 WITH l_PPV4(C10);
      l_SV4 WITH l_PV4(C11);
      l_PPV4 WITH l_PV4(C12);

  !covariance between intercept mean and true intercept
  eta_PPV with eta_PV;
  eta_PPV with eta_SV;
  eta_PV with eta_SV;

  !estimate latent means and label for constraints
  eta_PPV;
  eta_PV;
  eta_SV;

  !non-corretions between intercepts and wave 1 residuals
  eta_PPV with l_SV1@0 l_PV1@0 l_PPV1@0;
  eta_PV with l_SV1@0 l_PV1@0 l_PPV1@0;
  eta_SV with l_SV1@0 l_PV1@0 l_PPV1@0;

output: sampstat stdyx;
```

APPENDIX C

Mplus Syntax for RI-CLPM Using FIML in Sports

```
Variable:
  Names are
    dfemale cohort_7 age class_1 mommar13 dadmar13 incomeW1 incomeW2 incomeW3
    incomeW4 v1613 SVm2 v1625 SVr2 v1661 SVsp2 SVsc2 PPVm2 PPVr2 PPVsp2
    PPVsc2 PVm2 PVr2 PVsc2 PVsp2 PPCm2 PPCr2 PPCsp2 v21612 SVm3 v21625
    SVr3 v21672 SVsp3 SVsc3 PVm3 PVr3 PVsp3 PPVm3 PPVr3 PPVsp3 PPVsc3
    v21699 v21700 v21701 PPCm3 PPCr3 PPCsp3 v31612 SVm4 v31626 SVr4 v31696
    SVsp4 SVsc4 PVm4 PVr4 PVsp4 PPVm4 PPVr4 PPVsp4 PPVsc4 PPCm4 PPCr4
    PPCsp4 PVsc3 PVsc4 conflict2 conflict3 conflict4 classroomW2 parentEd
    conflict1 white black asian other mathW1 mathW2 mathW3 mathW4 readW1
    readW2 readW3 readW4 sportW1 sportW2 sportW3 sportW4;

    subpopulation is (cohort_7 == 3)or (cohort_7 == 4) or (cohort_7 == 6);
    usevar= SVsp2 SVsp3 SVsp4 !child importance W2-4
         PPVsp2 PPVsp3 PPVsp4 !child perceived parent importance W2-4
         PVsp2 PVsp3 PVsp4 !parent importance W2-4
         dfemale age;

        Cluster=class_1;

       Missing are all (-99);

   Analysis:
       Estimator=MLR;
       model=nocovariances;
       ITERATIONS=500000;
       TYPE=complex;

   Model:
 [dfemale];
 [age];

    !autoregressions/stability paths
    SVsp3 on SVsp2;
    SVsp4 on SVsp3;

    PPVsp3 on PPVsp2(C2);
    PPVsp4 on PPVsp3(C2);

    PVsp3 on PVsp2 (C3);
    PVsp4 on PVsp3 (C3);
```

```
  !cross-lagged paths
   !wave2-3
       PPVsp3 on PVsp2(C4);
       PPVsp3 on SVsp2(C5);

       PVsp3 on PPVsp2(C6);
       PVsp3 on SVsp2(C7);

       SVsp3 on PPVsp2(C8);
       SVsp3 on PVsp2(C9);

   !wave3-4
       PPVsp4 on PVsp3(C4);
       PPVsp4 on SVsp3(C5);

       PVsp4 on PPVsp3(C6);
       PVsp4 on SVsp3(C7);

       SVsp4 on PPVsp3(C8);
       SVsp4 on PVsp3(C9);

  !estimate within-wave covariances
       SVsp2 WITH PPVsp2(C10);
       SVsp2 WITH PVsp2(C11);
       PPVsp2 WITH PVsp2(C12);

       SVsp3 WITH PPVsp3(C10);
       SVsp3 WITH PVsp3(C11);
       PPVsp3 WITH PVsp3(C12);

       SVsp4 WITH PPVsp4(C10);
       SVsp4 WITH PVsp4(C11);
       PPVsp4 WITH PVsp4(C12);

  !controls
   SVsp2 on age dfemale;

   PPVsp2 on age dfemale;

   PVsp2 on age dfemale;

output: sampstat stdyx;
```

APPENDIX D

Mplus Syntax for RI-CLPM Using FIML in Music

```
Variable:
 Names are
   dfemale cohort_7 age class_1 mommar13 dadmar13 incomeW1 incomeW2f
   incomeW3 incomeW4 v1613 SVm2 v1625 SVr2 v1661 SVsp2 SVsc2 PPVm2 PPVr2
   PPVsp2 PPVsc2 PPVmu2 PVmu2 PVm2 PVr2 PVsc2 PVsp2 PPCm2 PPCr2 PPCsp2
   v21612 SVm3 v21625 SVr3 SVmu3 v21672 SVsp3 SVsc3 PVm3 PVr3 PVsp3 PVmu3
   PPVm3 PPVr3 PPVsp3 PPVsc3 v21699 v21700 PPVmu3 PPCm3 PPCr3 PPCsp3
   v31612 SVm4 v31626 SVr4 SVmu4 v31696 SVsp4 SVsc4 PVm4 PVr4 PVsp4 PVmu4
   PPVm4 PPVr4 PPVsp4 PPVsc4 PPVmu4 PPCm4 PPCr4 PPCsp4 PVsc3 PVsc4 conflict2
   conflict3 conflict4 classroomW2 parentEd conflict1 SVmu2 white black
   asian other mathW1 mathW2 mathW3 mathW4 readW1 readW2 readW3 readW4
   sportW1 sportW2 sportW3 sportW4;

   subpopulation is (cohort_7 == 3)or (cohort_7 == 4) or (cohort_7 == 6); !grade 1, 2, & 4
   usevar= SVmu2 SVmu3 SVmu4 !youth importance W2-4
         PVmu2 PVmu3 PVmu4 !parent importance W2-4
         age dfemale incomeW1 parentED;!controls

       Cluster=class_1;

      Missing are all (-99);

  Analysis:
      Estimator=MLR;
      model=nocovariances;
      ITERATIONS=500000;
      TYPE=complex;
      coverage=.001;

  Model:
[age];
[incomeW1];
[parentED];
[dfemale];

  !structural model:

   !create intercepts
   eta_SVmu by SVmu2@1 SVmu3@1 SVmu4@1;
   eta_PVmu by PVmu2@1 PVmu3@1 PVmu4@1;
```

```
!estimate structured residuals
l_SVmu2 by SVmu2@1;
l_SVmu3 by SVmu3@1;
l_SVmu4 by SVmu4@1;

l_PVmu2 by PVmu2@1;
l_PVmu3 by PVmu3@1;
l_PVmu4 by PVmu4@1;


!all residuals variables are freely estimated
l_SVmu2;
l_SVmu3;
l_SVmu4;

l_PVmu2;
l_PVmu3;
l_PVmu4;


!constrain residual variances of observed variables to identify residual variables
SVmu2@0;
SVmu3@0;
SVmu4@0;

PVmu2@0;
PVmu3@0;
PVmu4@0;

!autoregressions
l_SVmu3 on l_SVmu2(C1);
l_SVmu4 on l_SVmu3(C1);

l_PVmu3 on l_PVmu2(C2);
l_PVmu4 on l_PVmu3(C2);

!cross-lagged paths

  !wave2-3

     l_PVmu3 on l_SVmu2(C3);
     l_SVmu3 on l_PVmu2;!freely estimated for variant in stationarity test

  !wave3-4
     l_PVmu4 on l_SVmu3(C3);
     l_SVmu4 on l_PVmu3;!freely estimated for variant in stationarity test
```

```
!estimate within-wave residual covariances

    l_SVmu2 WITH l_PVmu2(C5);
    l_SVmu3 WITH l_PVmu3(C5);
    l_SVmu4 WITH l_PVmu4(C5);

!covariance between intercepts
eta_PVmu with eta_SVmu;

eta_PVmu;
eta_SVmu;

 !prevent correlation between intercepts & W2 residuals

eta_PVmu with l_SVmu2@0 l_PVmu2@0;
eta_SVmu with l_SVmu2@0 l_PVmu2@0;


   !controls on W2 residuals and intercepts
 l_SVmu2 on age incomeW1 parentED dfemale;

 l_PVmu2 on age incomeW1 parentED dfemale;

 eta_PVmu on age incomeW1 parentED dfemale;
 eta_SVmu on age incomeW1 parentED dfemale;


!control correlations
age with incomeW1;
age with parentED;
age with dfemale;
incomeW1 with parentED;
incomeW1 with dfemale;
parentED with dfemale;

  output: sampstat stdyx;
```