

Long-Term Association of Parental Warmth With Depression and Obesity: Mediation by Conscientiousness

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Objective: The current study examined the psychosocial processes related to the health outcomes of depression and obesity. Specifically, the mediating role of participant's trait conscientiousness on the relation between early experiences of paternal/maternal warmth and later depressive symptoms/obesity across 20 years and how this relationship is moderated by age across adulthood. **Method:** The current study utilized a national longitudinal data set, Midlife in the United States. Participants ($N = 2,257$) completed a survey rating the warmth they received from their fathers and mothers as children at Time 1 (T1; Ages 25–75). Participants reported their trait conscientiousness 10 years later (Time 2; T2). Depressive symptoms and body mass index were collected 10 years later (Time 3; T3). A moderated mediation model was used to examine whether the effect of parental warmth on health outcomes was mediated by trait conscientiousness and moderated by age. **Results:** An indirect effect of maternal warmth on depressive symptoms and obesity, mediated by conscientiousness, was found. This effect is moderated by age such that the indirect effect is stronger in older adults. While paternal warmth did not have a significant indirect effect on either depressive symptoms or obesity, the effect was not significantly different from the maternal indirect effect. **Conclusion:** The study supported the role of trait conscientiousness in linking the effect of early parental warmth to later health outcomes. This study also found that the strength of the indirect effect of parental warmth through conscientiousness increases with age.

Keywords: depression, obesity, conscientiousness, parental warmth, life span

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Depression and obesity are two of the most common and increasingly prevalent ailments that are well-acknowledged to be associated with negative life outcomes. Depression affects approximately one in six adults at some point in their lives in the

contemporary United States (Kessler et al., 2005), and is linked to a large number of negative outcomes such as work impairment, mental health problems, financial costs to society, and generally worse health (Keenan-Miller et al., 2007; Moussavi et al., 2007). Another major health problem in the United States is the ongoing epidemic of obesity. According to research compiled by the Centers for Disease Control and Prevention (CDC) approximately 36.5%, or about 1 out of 3, adults were obese in the 2011–2014 time frame (Ogden et al., 2015). Obesity is linked to an increased risk of diabetes, stroke, and heart attack (Ogden et al., 2015).

Given how common, detrimental to health, and costly depression and obesity are, understanding the risk factors of these diseases and how they develop is an important goal. A meta-analysis confirmed that depression and obesity reciprocally increase the risk of each other longitudinally, and this relationship could be mediated by individual's inability to regulate impulses and emotions (Luppino et al., 2010). Additionally, obesity and depression share a common risk factor: negative early childhood experiences and poor parenting such as a lack of warmth (Brussoni et al., 2015; Flouri & Buchanan, 2003; Sadowski et al., 1999; Sleddens et al., 2011). In addition to social environment, some personality traits, in particular, trait conscientiousness (i.e., how orderly and disciplined one is and their ability to control impulses), are found to be strong predictors of both obesity and depression (Shanahan et al., 2014). Finally, given that depression and obesity are often chronic problems, understanding the life course that puts individuals on a

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pathway toward depression or obesity can help inform future prevention and intervention efforts (Shanahan et al., 2014).

The Life Course of Personality Model

The current study adopted the life course of personality model to guide the current investigation of the development of depression and obesity throughout the life course. The life course of personality model argues that experiences early in our life (e.g., early experiences with parents) shape individual's behaviors throughout their lives in a number of areas including, extracurricular activities, academic success, and management of health (Shanahan et al., 2014). Additionally, cumulative advantages and disadvantages accrue throughout an individual's life; therefore it is important to take a life course perspective to further understand how an individual develops health problems, including obesity and depression (Shanahan et al., 2014).

The model posits that the process of development from childhood to adulthood is important for understanding the role of trait conscientiousness in the development of depression and obesity (Shanahan et al., 2014). This model hypothesized that the development of healthy behaviors, resulting in part from interactions with parents when one is a child, and the ability to maintain healthy behaviors among individuals who are high in trait conscientiousness can result in living healthier lives overall (Shanahan et al., 2014). Finally, understanding age as a moderator of this relationship may also be necessary as the development of health problems throughout one's life is likely to be complex and may be nonlinear in nature with many health problems occurring and accumulating in older age (Shanahan et al., 2014). The current study examined age as a potential moderator to understand these complex relationships as the effect of trait conscientiousness may accumulate over time.

Parental Warmth and Long-Term Depression and Obesity

There are many known predictors of obesity and depression such as diet, culture, and past experiences (Sleddens et al., 2011). According to the life course of personality model, it is crucial to examine how early childhood experience plays a role in later development of depression and obesity. Specifically, the current study focused on the role of parental warmth. One established predictor for obesity and depression is the parental warmth that an individual receives early in their life from both his or her mother and father (Mezulis et al., 2006; Sokol et al., 2017). Parents with an authoritative parenting style, which is characterized in part by high warmth, have children who display higher physical activity levels and lower body mass index (BMI) (Sleddens et al., 2011). In contrast, harsh parenting, which is punitive and low in warmth, is related to higher levels of obesity (Lohman et al., 2016). In addition, these effects seem to be persistent and continue throughout childhood and into adulthood (Herman et al., 2009).

Similar to obesity, depression is known to be related to the early parenting an individual receives and continues to affect individuals throughout their lives (Sadowski et al., 1999; Yap et al., 2014). Attachment style with parents has been related to a number of health outcomes (Bureau et al., 2017). This is reflected in research that examines the origins of adult depression, which suggests that

a poor relationship with one's parents is associated with an increased risk of depression (Ingram, 2003). Specifically, insufficient parental warmth can result in an insecure attachment style, which is characterized by mistrust in relationships with others and can lead to a dysfunctional interpersonal relationship that could heighten the risk of depression (Ingram, 2003). Consistent research findings support the idea that parental involvement and warmth is associated with their adult offspring's mental health (Baker & Hoerger, 2012). Children who have warm relationships with their parents are more prosocial (Daniel et al., 2016), are more responsive to attempts to influence eating habits (Lessard et al., 2010), and are at lower risk for both depression and anxiety (Yap et al., 2014).

Although extensive research has been done on how parental warmth is related to depression and obesity, a large proportion of this research has primarily focused on how maternal, and to a much lesser extent paternal, characteristics are related to long-term health outcomes for their offspring (for a review, see Bowlby, 2008). However, there seem to be differences between the effect of mother and father involvement on children's later psychological distress with fathers appearing to have unique effects beyond the effects of mothers (Flouri & Buchanan, 2003; Gerhardt et al., 2020). For example, father involvement was found to reduce psychological distress, and this was independent from maternal involvement (Flouri & Buchanan, 2003). Therefore, it is important to examine the effect of both mother's and father's parenting in early life on adult's depression and obesity.

Mediation by Trait Conscientiousness

Informed by the life course of personality model, individual differences, in particular, personality, are important psychosocial factors in individual's long-term outcomes in a wide variety of domains such as job success (Sutin et al., 2009), relationship satisfaction (White et al., 2004), and physical and mental health (Goodwin & Friedman, 2006). A widely used conceptualization of trait level personality is the Big Five or Five Factor model (McCrae & John, 1992). This model proposes five different constructs that form an individual's personality: openness, conscientiousness, extraversion, agreeableness, and neuroticism.

Among all these traits, conscientiousness has been widely studied as an inverse predictor of depression and obesity (Shanahan et al., 2014). Conscientiousness can be thought of as how orderly and disciplined one is, as well as how hardworking they are, their level of self-discipline, ability to control impulses, and capability to delay gratification (McCrae & John, 1992; Shanahan et al., 2014). The construct of trait conscientiousness has been replicated across numerous cultures and ages, suggesting it is fundamental to human psychology and behavior (McCrae & Costa, 1997; Roberts & DelVecchio, 2000). There has been a great deal of work that focuses on the predicting role of trait conscientiousness in health outcomes. Higher levels of trait conscientiousness have been consistently shown to be among the strongest and exceedingly consistent predictors of lower levels of depression and less obesity (Bogg & Roberts, 2004; Goodwin & Friedman, 2006; Shanahan et al., 2014). Additionally, it has been widely studied and accepted that trait conscientiousness affects many aspects of health through mediating a wide variety of effects; furthering understanding of these mediational chains and the moderating factors associated

with them is an important future direction for research into trait conscientiousness and health (Bogg & Roberts, 2004; Shanahan et al., 2014).

An exciting potential direction for understanding health processes is to explore how trait conscientiousness acts as a bridge between early parental influences and long-term health outcomes. It has been argued that early parental behaviors, including warmth, lay the foundation for the development of trait conscientiousness (Eisenberg et al., 2014). Higher parental warmth is predictive of better self-regulation, including inhibition, delay of gratification, and modulating emotions (Eisenberg et al., 2014). The ability to self-regulate then serves as a foundational aspect of trait conscientiousness through internalization of rules and standards (Eisenberg et al., 2014). Hence, it is possible that early parenting may shape one's trait conscientiousness, which in turn is associated with depression and obesity.

Age as Moderator

Most studies assume a direct effect between trait conscientiousness and health outcomes, either physical or mental, but it is likely that the relationship is more complicated (Shanahan et al., 2014). As suggested by the life course of personality model, it is important to address what the authors view as a shortcoming of the extant literature, the need to understand the mechanisms that link trait conscientiousness with health and how these operate (Shanahan et al., 2014). This view suggests that as individuals age trait conscientiousness increases in importance. A defining characteristic of individuals high in trait conscientiousness is a high level of orderliness and following of plans (Shanahan et al., 2014). The short-term health gains from following a plan, for example, a diet, are typically minimal; it is only over time that the effects of a diet create larger disparities in weight. Similarly, those high in trait conscientiousness can create slightly better life opportunities for themselves over time through healthier choices and more effective coping behaviors (Shanahan et al., 2014), which can help improve these individuals' mental and physical health. In short, hard work and persistence pay off, and are among the strongest predictors in psychology of long-term outcomes, but it can take years for engagement in health behaviors to benefit individual's health (Roberts et al., 2007).

Current Study

The aim of the current study was to understand the mediational pathways from parental warmth in childhood to the health outcomes of depression and obesity in later life through trait conscientiousness. Previous work has focused primarily on mothers' parenting, largely ignoring fathers (Paquette, 2004); the current study examined both maternal and paternal parenting. Furthermore, past studies have primarily examined direct relations of early parenting with depression and obesity (Shanahan et al., 2014). The life course of personality model suggests the relation is likely to be more complicated and to further the literature consideration of mediators and moderators is needed (Shanahan et al., 2014). The current study tested trait conscientiousness as a mediator between childhood parental warmth and adult health outcomes and further explored the moderating role of age on this mediational pathway.

The current study used a publicly available longitudinal data set, known as Midlife in the United States (MIDUS), that followed the participants for 20 years throughout adulthood and assessed participants' perceived parental warmth, Big Five personality traits, and long-term mental health outcomes. This longitudinal study design was particularly valuable for testing the role of personality traits as it is thought to take time for individual's personality to generate detectable change in health outcomes. While there have been many studies using MIDUS data to examine the factors contributing to health outcomes including depression and obesity (e.g., Goodwin & Friedman, 2006), the current study adds to the literature by examining mediators and moderators through which early parenting has an effect on later health. First, it was hypothesized that trait conscientiousness would mediate the relation between perceived parental warmth and self-reported mental health and obesity; parental warmth would positively predict trait conscientiousness which would predict less future depressive symptoms and obesity. Second, it was hypothesized that age would moderate the mediational relation between parental warmth, trait conscientiousness, and depression and obesity in a moderated mediation framework. It is expected that older individuals would have a stronger relation between trait conscientiousness and depressive symptoms/obesity as they would have had a longer time to benefit from more conscientious behaviors.

Method

Participants

Data for the current study were drawn from a random digit dialing (RDD), large, national, secondary data set called MIDUS. The original MIDUS (called MIDUS 1; T1 in this study) data set was collected from 1995–1996. Participants had to be between 25 and 75 years old and live in the United States. The follow up to MIDUS 1, called MIDUS 2 (T2), was collected from 2004–2006. The third time point, called MIDUS 3 (T3), was collected from 2013–2014. To be included in the current study participants had to participate at T2 ($N = 2,257$). Approximately 70% of the participants were retained from T1 to T2 and T2 to T3 had a 62.6% retention rate. Participants had a mean age of 46.65 ($SD = 12.83$) and were 53.5% female at T1, 32.2% of participants had at least a 4-year college degree. Participants had an average income of \$68,233.58. The majority of participants were White (88.4%), 5.6% were Black/African American, and the remaining 6% include Asian or Pacific Islander, Native American or Aleutian Islander/Eskimo, multiracial, and other. Among participants in the current study, 7.76% has some high school or less, 28.24% completed high school/GED, 30.50% had some college, and 33.50% had a college degree or higher.

Procedures and Measures

Participants completed a telephone interview and self-administered questionnaire at all three time points. In the self-administered questionnaire, participants rated the perceived parental warmth they received as children at T1, and their trait conscientiousness, depressive symptoms, as well as self-reported weight and height at all 3 time points. The measures used in the MIDUS study were developed by a group of multidisciplinary experts and pilot tested the scales (see more

in Brim et al., 2019). A full list of items used in the current study can be found in Table 2 in the online supplemental materials. The current study was exempted from institutional review board review as the MIDUS dataset is a publicly available dataset that does not include identifiable information.

Maternal and Paternal Warmth

At T1, participants completed 7 items on a 4-point Likert scale describing their perceived level of warmth received from each of their parents growing up adapted from Rossi (2001). Items were rated from 1 (*A lot*) to 4 (*Not at all*) and reverse coded for ease of interpretation. Example items include: “How much love and affection did she [mother]/he [father] give you?” and “How much did she [mother]/he [father] understand your problems and worries?” Maternal warmth had a Cronbach’s alpha of 0.91, paternal warmth had a Cronbach’s alpha of 0.93. A latent variable using all seven items as indicators was created and used in all analyses.

Conscientiousness

Participants were asked to indicate how well statements described them on five items related to conscientiousness, adapted from Rossi (2001), on a 4-point Likert scale from 1 (*A lot*) to 4 (*Not at all*) and reverse coded for ease of interpretation. Example items include: Organized and Hardworking. These items had a Cronbach’s alpha of 0.69. The mean of these items was used as the scale score for conscientiousness. This measure is also used in other publications examining personality traits (e.g., Goodwin & Friedman, 2006).

Depressive Symptoms

Participants’ depressive symptoms were assessed using Mrcozek and Kolarz’s (1998) Negative and Positive Affect Scale. Participants rated the frequency of 6 items related to depressive symptoms on a 5-point Likert scale from 1 (*all of the time*) to 5 (*none of the time*) at T1 and T3. These items were reverse coded these items to 0 (*none of the time*) to 4 (*all of the time*). Cronbach’s alpha was 0.87 at T1 and 0.85 at T3. This scale has been shown to have good psychometric properties (Chan et al., 2020). A latent variable using all six items as indicators was created and used in all analyses.

BMI

BMI was calculated based on participants self-reported height and weight and then calculating their BMI. A BMI of 30 or greater is considered obese according to the CDC.

Age

Participants were also asked for their birthdate which was used to calculate their age in years. This was used as a moderator of the effect of conscientiousness on obesity and depression.

Covariates

Participants were asked to report highest educational attainment on 12 levels, ranging from less than high school to terminal degree, which was treated as a continuous variable in analyses. Race and gender were both included as covariates. Race was dichotomized to White and non-White as over 88% of participants were White.

These variables were used as covariates as they have been found to be related to depression and obesity in previous work and are associated with a wide variety of health outcomes (Luppino et al., 2010).

Data Analyses

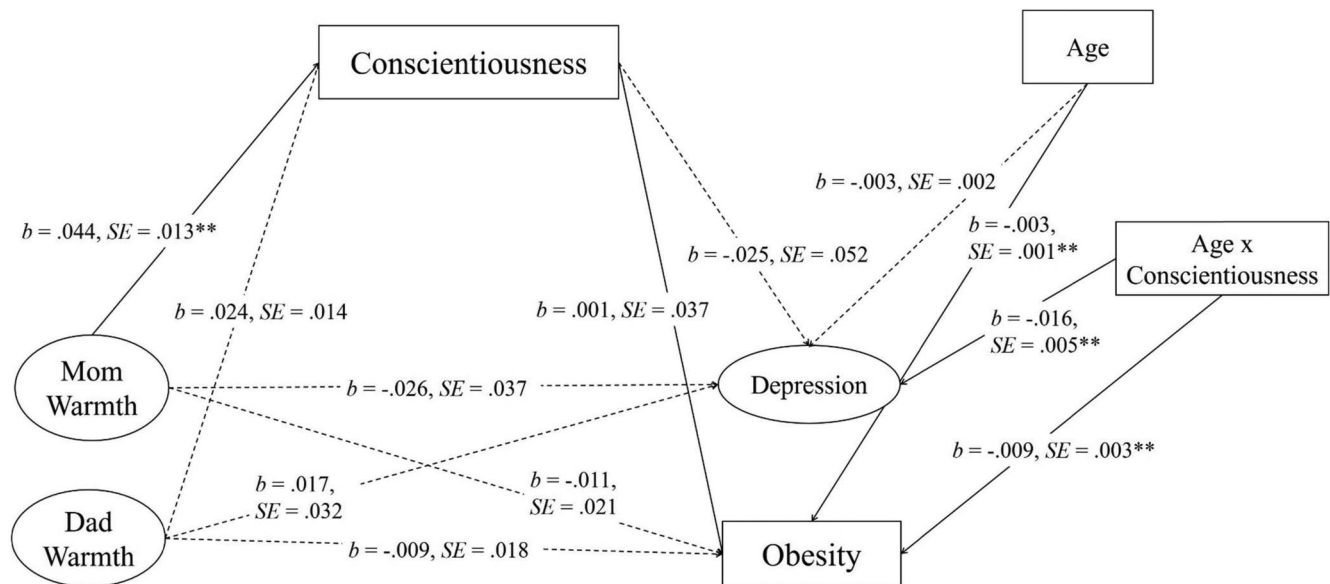
Data were analyzed using the lavaan package in R (Rosseel, 2012). Missing data percentages at T1 across all variables range from 0–12.5%. This percentage of missing data across all variables increases to 20% at T2 and further increases to 48–49% at T3. Little’s missing completely at random test revealed the data were not missing completely at random ($\chi^2 = 436.17$, $df = 198$, $p < .01$). However, the missing pattern can be predicted by age, education, and conscientiousness, which was supported by the results of separate variance *t* tests. Pairwise deletion was used to handle missing data as this has been tested to be most effective with analysis using diagonal weighted least squares (DWLS; Asparouhov & Muthén, 2010).

Path analysis models were estimated using DWLS estimator as the variables were ordinal and DWLS has been shown to be an appropriate estimator for ordinal variables (Asparouhov & Muthén, 2010). Latent variables of paternal and maternal warmth at T1 were entered as independent predictors, the mean score of conscientiousness at T2 was entered as a mediator, age at T2 as a moderator and the latent variable of depressive symptoms and measured variable of BMI at T3 were entered as dependent variables (Figure 1). Previous depressive symptoms and obesity were controlled for in all analyses, as these health problems tend to persist over time as was previous conscientiousness (Herman et al., 2009). BMI was dichotomized into less than 30 (not obese) and 30 or greater (obese) so the probability of being obese could be estimated rather than estimating changes in BMI which can be difficult to interpret in a meaningful way. Next, the conditional effect of maternal/paternal warmth was probed at one standard deviation below the mean age (43.08), at the mean age (55.84), and one standard deviation above the mean age (68.60). Additionally, we tested the interaction at young adulthood (Age 30), middle adulthood (Age 50), and older adulthood (Age 70) to have a more meaningful interpretation of the participant’s age. These age groups were chosen as they correspond to meaningful developmental stages and also produced groups that were all of sufficient size ($n > 200$) to run the analyses. Participant education was entered as a covariate as were previous time points of depressive symptoms and obesity status. Indirect effects were tested with 10,000 bootstrap samples. An initial model was run using race and gender as covariates; however, both variables were unrelated to both depression and obesity and were removed from the final model.

Results

Descriptive statistics and bivariate correlations for all study variables are available in the online supplemental materials (Part 1). All items measuring maternal and paternal warmth were significantly positively correlated. Conscientiousness was significantly positively correlated with maternal and paternal warmth but negatively correlated with depression at both T1 and T3. The first step of analyses was to estimate a measurement model for the

Figure 1
Moderated Mediation Model With Estimated Unstandardized Coefficients



Note. b = regression coefficient; SE = standard error.
 $^{**} p < .01$.

latent variables. This model fit well; root-mean-square error of approximation (RMSEA) = 0.041, RMSEA 90% CI [0.38, 0.043], comparative fit index (CFI) = 0.935, standardized root-mean-square residual (SRMR) = 0.037 and all items loaded significantly on their latent factors. Since the same items were used to measure both maternal and paternal warmth, errors of these items were correlated. Similarly, the same items were used to measure depressive symptoms at both T1 and T3 so their errors were correlated as well.

The structural model also fit well, RMSEA = 0.066, RMSEA 90% CI [0.064, 0.067], CFI = 0.942, SRMR = 0.059; full parameter estimates for the model are available in Table 1. The two outcome variables were depressive symptoms and obesity status at T3. The model explained a moderate amount of the variance in depressive symptoms ($R^2 = 0.255$) and in obesity status ($R^2 = 0.380$) at T3. Since past literature has suggested that depression and obesity are correlated with one another, the residual covariance between obesity and depressive symptoms was estimated but the covariance was not significant ($b = 0.015, SE = 0.010, p = .152$; Luppino et al., 2010). A complete model with unstandardized estimates can be found in the online supplemental materials (Part 2).

This model tested how the magnitude of the mediated effect varied as a function of age. The results using age at T2 at the mean, one standard deviation above and below the mean were essentially the same as using Ages 30, 50, and 70. Only the results using 30, 50, and 70 years of age were reported in the current study. The relationship between conscientiousness and depressive symptoms ($b = -0.016, SE = 0.005, p = .003$) as well as obesity ($b = -0.009, SE = 0.003, p = .004$) at T3 was moderated by age. More specifically, maternal warmth at T1 was related to decreased levels of depressive symptoms at T3 mediated by conscientiousness at T2, moderated by age at T2. Maternal warmth at T1 had a

significant indirect effect, mediated by conscientiousness, on depression in older ($b = -0.049, SE = 0.025, p = .047$), middle-aged ($b = -0.036, SE = 0.018, p = .044$), and younger adults ($b = -0.022, SE = 0.011, p = .039$). The strength of the indirect effect increased as individuals became older such that the effect on 70-year-olds was stronger than 50-year-olds which was stronger than 30-year-olds. The effect of paternal warmth at T1 did not have

Table 1
Estimated Parameters for the Moderated Mediation Model

Variables	b	SE	p value
Mediator: Conscientiousness T2			
Maternal warmth	0.044	0.016	.006
Paternal warmth	0.024	0.014	.089
Participant education	0.014	0.005	.003
Outcome: Depressive symptoms T3			
Maternal warmth	-0.026	0.037	.477
Paternal warmth	0.017	0.032	.602
Conscientiousness T2	-0.250	0.052	.637
Participant age	-0.003	0.002	.053
Age \times Conscientiousness	-0.016	0.005	.003
Depressive symptoms T1	0.410	0.050	<.001
Participant education	-0.049	0.009	<.001
Outcome: Obesity T3			
Maternal warmth	-0.011	0.021	.608
Paternal warmth	-0.009	0.018	.632
Conscientiousness T2	0.001	0.037	.985
Participant age	-0.003	0.001	<.001
Age \times Conscientiousness	-0.009	0.003	.004
Obesity T1	0.650	0.034	<.001
Participant education	-0.024	0.005	<.001

Note. b = regression coefficient; SE = standard error; T1 = Time 1; T2 = Time 2; T3 = Time 3.

any significant indirect effects on depressive symptoms or obesity at T3, however the difference between the indirect effects of maternal and paternal warmth at T1 on depressive symptoms at T3 were tested and the differences were not statistically significant at all age levels ($ps = .465-.468$).

Maternal warmth at T1 also had a significant indirect effect on reducing the likelihood of being obese at T3, mediated by conscientiousness at T2, among young, middle-, and old-aged adults. Maternal warmth at T1 was significantly related to **obesity** status in older ($b = 0.26$, $SE = 0.013$, $p = .049$), middle-aged ($b = 0.019$, $SE = 0.009$, $p = .045$), and younger adults ($b = 0.011$, $SE = 0.005$, $p = .040$). As individuals got older the strength of the indirect effect increased. Again, paternal warmth at T1 was not a significant predictor of obesity status at T3 for all three levels of age but the effect of paternal warmth at T1 was not significantly different from maternal warmth ($ps = .465-.469$). All indirect effects can be found in Table 2.

Discussion

Previous work has established that parenting is related to the health outcomes of depressive symptoms and obesity (Baker & Hoerger, 2012; Lessard et al., 2010). The current study attempted to expand this understanding by examining how conscientiousness mediates early experiences with both fathers and mothers in connection with depressive symptoms and obesity. It also examined how conscientiousness and age interact in predicting depressive symptoms and obesity in a moderated mediation framework. The current study found that conscientiousness mediated the relations between early maternal warmth and later depressive symptoms as well as obesity suggesting that this personality trait is important to consider in the development of both mental and physical health problems. Further, a significant moderating effect of age on conscientiousness for both depressive symptoms and obesity was found. Taken together these results indicated that conscientious-

ness was a mediator of the effect of early maternal warmth on depressive symptoms and obesity and this effect varies by age.

The current finding partly supported the first hypothesis. The current study found that conscientiousness mediated the relation between early maternal warmth, but not paternal warmth, and later health outcomes only when age was considered as a moderator. Early maternal warmth was significantly associated with higher conscientiousness. This is related to the idea that personality is at least somewhat malleable by environmental effects as has been found by past literature and theory (McCrae et al., 2000). Furthermore, conscientiousness significantly predicted less depressive symptoms and obesity, which was consistent with past research (Shanahan et al., 2014). The significant mediation relationship suggested that early maternal warmth enhances individuals' conscientiousness, which in turn reduced levels of depressive symptoms and likelihood of obesity.

Paternal warmth was not found to significantly predict conscientiousness, nor did it have an indirect effect through conscientiousness to either depressive symptoms or obesity. While it is possible that maternal warmth is more important than paternal warmth to children's outcomes, it is also possible that warmth is not how fathers relate to children. Recent work has suggested that fathers relationship with their children may be more focused on teaching children how to explore the world and interact with unexpected events rather than providing warmth (Paquette, 2004). Future work should consider other parenting constructs, such as challenging parenting behavior to understand fathers' parenting (Majdandžić et al., 2018). Furthermore, the difference between maternal and paternal warmth's indirect effects on depressive symptoms and obesity was not significant. This suggested that the effects of maternal and paternal warmth were similar even though only maternal warmth had a significant relationship with depressive symptoms and obesity.

The current results supported the second hypothesis: age moderates the mediation relationship. The interaction term between age and conscientiousness was significant in predicting both depressive symptoms and obesity; this indicated that at all ages the effect of conscientiousness was different. The strength of the mediating effect of conscientiousness increased as individuals age, indicating that conscientiousness has an increasing effect on depression and obesity as age increases. This directly supported the idea put forward by the life course of personality model that researchers must consider age when evaluating the effects of conscientiousness on health (Shanahan et al., 2014).

Another interesting aspect of this model is the lack of effect by both gender and race. The effect of race may be explainable as only a small portion of the sample is non-White (11.6%) and collapsing several different racial groups into one may create mixed signals that do not rise to the level of significance. The effect of gender, or lack thereof, on depression is more interesting, particularly as women are known to have a higher rate of depression compared to men (Moussavi et al., 2007). However, the relation between gender and depression is also known to be complicated and has many moderating factors such as socioeconomic status, family support, and personality (e.g., Flouri & Buchanan, 2003; Gerhardt et al., 2020; McCrae et al., 2000). It is possible that examining a direct relationship between gender and depression may have led to our lack of findings regarding depression. A more nuanced examination of this relation, including exploring a poten-

Table 2
Indirect Effects of Parental Warmth on Health Outcomes Mediated by Conscientiousness at Age 30, 50, and 70

Age	<i>b</i>	<i>SE</i>	<i>p</i> value
Maternal indirect effects on depressive symptoms			
30 years	−0.022	0.011	.039
50 years	−0.036	0.018	.044
70 years	−0.049	0.025	.047
Paternal indirect effects on depressive symptoms			
30 years	−0.012	0.008	.141
50 years	−0.019	0.013	.146
70 years	−0.027	0.019	.150
Maternal indirect effects on obesity			
30 years	−0.011	0.005	.040
50 years	−0.019	0.009	.045
70 years	−0.026	0.013	.049
Paternal indirect effects on obesity			
30 years	−0.006	0.004	.146
50 years	−0.010	0.007	.150
70 years	−0.014	0.010	.153

Note. *b* = regression coefficient; *SE* = standard error.

tial moderating or mediating process, may be required but is beyond the scope of the current study.

Results of the current study should be considered in light of the fact that it relied on a single reporter to retrospectively recall their childhood experiences. These experiences could be misremembered, and retrospective data is generally considered less ideal than prospective data. Additionally, participants self-reported height and weight which could be intentionally misreported due to factors such as social desirability or unintentionally misreported due to potentially inaccurate measurement. Relatedly, there may be issues of shared method variance as one reporter provided all responses. Further, many of the measures used in the current study are unique to MIDUS as it frequently uses shortened or adapted versions of well-established measures, leading to poorer reliability in some measures (Brim et al., 2019). Finally, it should be noted that this sample may not be representative of the overall population of the United States as the sample is predominately White. Future studies may want to test these same effects in more diverse samples. In addition, there are several other factors known to be related to development of depression and obesity such as socioeconomic status, health care access, diet, culture, and many other factors that are not within the scope of the current study. Future studies may want to examine these additional factors. Nonetheless, the current study also had several important strengths. First, the use of an RDD sample provided protection from biased sampling methodology and should, to an extent, alleviate concerns about representativeness of the sample. Second, the data was longitudinal which allowed us to test effects over time including mediating and moderating effects and shed light onto the moderating and mediating effects of how parenting affected health outcomes and accounts for developmental changes throughout adulthood. Future studies could use multiple reporters or observational techniques to reduce the shared methods variance and single reporter bias. In addition, future studies may want to consider other parenting constructs, particularly ones that may be more associated with father child relationships.

Future studies may want to examine potential bidirectional relationships between obesity, depression, and other variables such as the ability to exercise self-control (Sokol et al., 2017). Relatedly, depression could affect perceptions of parental warmth as participants recall their early childhood experience. It is possible that there is a reciprocal relationship between obesity, depression, and cognitive variables and that this relationship is quite nuanced. The relationship between cognitive variables and depression, as well as obesity, is known to be complicated and involves many moderators such as resilience and environment (Herman et al., 2009; Ingram, 2003; Lohman et al., 2016; Luppino et al., 2010). This study also has important practical implications for helping alleviate obesity and depression. First, children who are found to have lower levels of conscientiousness may need additional support as they are at increased likelihood of developing obesity and depression. This is particularly true for children who also have parents that lack warmth or are otherwise unavailable. Further, attempting to help parents express warmth toward their children and understanding the importance of this task may also help reduce obesity and depression. This study is a first step in beginning to understand how some of these moderators are related to the development of depression and obesity as well as how early interventions may be better able to prevent and treat obesity and depression.

The current study found that higher levels maternal warmth had a significant indirect effect, through conscientiousness, in reducing both depressive symptoms and obesity in later life. This suggested that researchers may want to consider psychosocial mediators, such as conscientiousness, when examining the role of parenting in health outcomes. In addition, this effect differed across all ages, highlighting the importance of considering developmental perspectives in understanding health processes and supporting the life course of personality model. The current study provided a further examination of the role of personality as a mediator for translating parenting in early childhood to both mental and physical health outcomes in individual's later life.

References

- Asparouhov, T., & Muthén, B. (2010). Weighted least squares estimation with missing data. <http://www.statmodel.com/download/GstrucMissingRevision.pdf>
- Baker, C. N., & Hoerger, M. (2012). Parental child-rearing strategies influence self-regulation, socio-emotional adjustment, and psychopathology in early adulthood: Evidence from a retrospective cohort study. *Personality and Individual Differences*, 52(7), 800–805. <https://doi.org/10.1016/j.paid.2011.12.034>
- Bogg, T., & Roberts, B. W. (2004). Conscientiousness and health-related behaviors: A meta-analysis of the leading behavioral contributors to mortality. *Psychological Bulletin*, 130(6), 887–919. <https://doi.org/10.1037/0033-2909.130.6.887>
- Bowlby, J. (2008). *Attachment*. Basic Books.
- Brim, O. G., Ryff, C. D., & Kessler, R. C. (Eds.). (2019). *How healthy are we?: A national study of well-being at midlife*. University of Chicago Press.
- Brussoni, M., Gibbons, R., Gray, C., Ishikawa, T., Sandseter, E. B. H., Bienenstock, A., Chabot, G., Fuselli, P., Herrington, S., Janssen, I., Pickett, W., Power, M., Stanger, N., Sampson, M., & Tremblay, M. S. (2015). What is the relationship between risky outdoor play and health in children? A systematic review. *International Journal of Environmental Research and Public Health*, 12(6), 6423–6454. <https://doi.org/10.3390/ijerph120606423>
- Bureau, J.-F., Martin, J., Yurkowski, K., Schmiedel, S., Quan, J., Moss, E., Deneault, A.-A., & Pallanca, D. (2017). Correlates of child–father and child–mother attachment in the preschool years. *Attachment & Human Development*, 19(2), 130–150. <https://doi.org/10.1080/14616734.2016.1263350>
- Chan, M. H., Gerhardt, M., & Feng, X. (2020). Measurement invariance across age groups and over 20 years' time of the Negative and Positive Affect Scale (NAPAS). *European Journal of Psychological Assessment*, 36(4), 537–544.
- Daniel, E., Madigan, S., & Jenkins, J. (2016). Paternal and maternal warmth and the development of prosociality among preschoolers. *Journal of Family Psychology*, 30(1), 114–124. <https://doi.org/10.1037/fam0000120>
- Eisenberg, N., Duckworth, A. L., Spinrad, T. L., & Valiente, C. (2014). Conscientiousness: Origins in childhood? *Developmental Psychology*, 50(5), 1331–1349. <https://doi.org/10.1037/a0030977>
- Flouri, E., & Buchanan, A. (2003). The role of father involvement in children's later mental health. *Journal of Adolescence*, 26(1), 63–78. [https://doi.org/10.1016/S0140-1971\(02\)00116-1](https://doi.org/10.1016/S0140-1971(02)00116-1)
- Gerhardt, M., Feng, X., Wu, Q., Hooper, E., Ku, S., & Chan, M. H. (2020). A naturalistic study of parental emotion socialization: Unique contributions of fathers. *Journal of Family Psychology*, 34(2), 204–214.
- Goodwin, R. D., & Friedman, H. S. (2006). Health status and the five-factor personality traits in a nationally representative sample. *Journal of Health Psychology*, 11(5), 643–654. <https://doi.org/10.1177/13591053060066610>

- Herman, K. M., Craig, C. L., Gauvin, L., & Katzmarzyk, P. T. (2009). Tracking of obesity and physical activity from childhood to adulthood: The Physical Activity Longitudinal Study. *International Journal of Pediatric Obesity*, 4(4), 281–288. <https://doi.org/10.3109/17477160802596171>
- Ingram, R. (2003). Origins of cognitive vulnerability to depression. *Cognitive Therapy and Research*, 27(1), 77–88. <https://doi.org/10.1023/A:1022590730752>
- Keenan-Miller, D., Hammen, C. L., & Brennan, P. A. (2007). Health Outcomes Related to Early Adolescent Depression. *Journal of Adolescent Health*, 41(3), 256–262. <https://doi.org/10.1016/j.jadohealth.2007.03.015>
- Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the national comorbidity survey replication. *Archives of General Psychiatry*, 62(6), 593. <https://doi.org/10.1001/archpsyc.62.6.593>
- Lessard, J., Greenberger, E., & Chen, C. (2009). Adolescents' response to parental efforts to influence eating habits: When parental warmth matters. *Journal of Youth and Adolescence*, 39(1), 73–83. <https://doi.org/10.1007/s10964-008-9376-6>
- Lohman, B. J., Gillette, M. T., & Neppl, T. K. (2016). Harsh parenting and food insecurity in adolescence: The association with emerging adult obesity. *Journal of Adolescent Health*, 59(1), 123–127. <https://doi.org/10.1016/j.jadohealth.2016.03.024>
- Luppino, F. S., de Wit, L. M., Bouvy, P. F., Stijnen, T., Cuijpers, P., Penninx, B. W. J. H., & Zitman, F. G. (2010). Overweight, obesity, and depression: A systematic review and meta-analysis of longitudinal studies. *Archives of General Psychiatry*, 67(3), 220. <https://doi.org/10.1001/archgenpsychiatry.2010.2>
- Majdandžić, M., Lazarus, R. S., Oort, F. J., van der Sluis, C., Dodd, H. F., Morris, T. M., De Vente, W., Byrow, Y., Hudson, J., & Bögels, S. M. (2018). The structure of challenging parenting behavior and associations with anxiety in Dutch and Australian children. *Journal of Clinical Child and Adolescent Psychology*, 47(2), 282–295. <https://doi.org/10.1080/15374416.2017.1381915>
- McCrae, R. R., & Costa, P. T. (1997). Personality trait structure as a human universal. *American Psychologist*, 52(5), 509–516. <https://doi.org/10.1037/0003-066X.52.5.509>
- McCrae, R. R., Costa, P. T., Ostendorf, F., Angleitner, A., Hrebícková, M., Avia, M. D., Sanz, J., Sánchez-Bernardos, M. L., Kusdil, M. E., Woodfield, R., Saunders, P. R., & Smith, P. B. (2000). Nature over nurture: Temperament, personality, and life span development. *Journal of Personality and Social Psychology*, 78(1), 173–186. <https://doi.org/10.1037/0022-3514.78.1.173>
- McCrae, R. R., & John, O. P. (1992). An introduction to the five-factor model and its applications. *Journal of Personality*, 60(2), 175–215. <https://doi.org/10.1111/j.1467-6494.1992.tb00970.x>
- Mezulis, A. H., Hyde, J. S., & Abramson, L. Y. (2006). The developmental origins of cognitive vulnerability to depression: Temperament, parenting, and negative life events in childhood as contributors to negative cognitive style. *Developmental Psychology*, 42(6), 1012–1025. <https://doi.org/10.1037/0012-1649.42.6.1012>
- Moussavi, S., Chatterji, S., Verdes, E., Tandon, A., Patel, V., & Ustun, B. (2007). Depression, chronic diseases, and decrements in health: Results from the World Health Surveys. *The Lancet*, 370(9590), 851–858. [https://doi.org/10.1016/S0140-6736\(07\)61415-9](https://doi.org/10.1016/S0140-6736(07)61415-9)
- Mroczek, D. K., & Kolarz, C. M. (1998). The effect of age on positive and negative affect: A developmental perspective on happiness. *Journal of Personality and Social Psychology*, 75(5), 1333–1349. <https://doi.org/10.1037/0022-3514.75.5.1333>
- Ogden, C., Carroll, M., Fryar, C., & Flegal, K. (2015). Prevalence of obesity among adults and youth, 2011–2014. *NCHS Data Brief*, 2015(219), 1–8.
- Paquette, D. (2004). Theorizing the father-child relationship: Mechanisms and developmental outcomes. *Human Development*, 47(4), 193–219. <https://doi.org/10.1159/000078723>
- Roberts, B. W., & DelVecchio, W. F. (2000). The rank-order consistency of personality traits from childhood to old age: A quantitative review of longitudinal studies. *Psychological Bulletin*, 126(1), 3–25. <https://doi.org/10.1037/0033-2909.126.1.3>
- Roberts, B. W., Kuncel, N. R., Shiner, R., Caspi, A., & Goldberg, L. R. (2007). The power of personality: The comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science*, 2(4), 313–345. <https://doi.org/10.1111/j.1745-6916.2007.00047.x>
- Rosseel, Y. (2012). lavaan: An R package for structural equation modeling and more. *Journal of Statistical Software*, 48(2), 1–22. <https://doi.org/10.18637/jss.v048.i02>
- Rossi, A. S. (Ed.). (2001). Developmental roots of adult social responsibility. *John D. and Catherine T. MacArthur Foundation series on mental health and development. Studies on successful midlife development. Caring and doing for other: Social responsibility in the domains of family, work, and community* (pp. 227–320). University of Chicago Press.
- Sadowski, H. S., Ugarte, B., Kolvin, I., Kaplan, C. E., & Barnes, J. (1999). Early life family disadvantages and major depression in adulthood. *The British Journal of Psychiatry*, 174(2), 112–120. <https://doi.org/10.1192/bjp.174.2.112>
- Shanahan, M. J., Hill, P. L., Roberts, B. W., Eccles, J., & Friedman, H. S. (2014). Conscientiousness, health, and aging: The life course of personality model. *Developmental Psychology*, 50(5), 1407–1425. <https://doi.org/10.1037/a0031130>
- Sleddens, E. F. C., Gerards, S. M. P. L., Thijs, C., De Vries, N. K., & Kremers, S. P. J. (2011). General parenting, childhood overweight and obesity-inducing behaviors: A review. *International Journal of Pediatric Obesity*, 6(2-2), e12. <https://doi.org/10.3109/17477166.2011.566339>
- Sokol, R. L., Qin, B., & Poti, J. M. (2017). Parenting styles and body mass index: A systematic review of prospective studies among children. *Obesity Reviews*, 18(3), 281–292. <https://doi.org/10.1111/obr.12497>
- Sutin, A. R., Costa, P. T., Miech, R., & Eaton, W. W. (2009). Personality and career success: Concurrent and longitudinal relations. *European Journal of Personality*, 23(2), 71–84. <https://doi.org/10.1002/per.704>
- White, J. K., Hendrick, S. S., & Hendrick, C. (2004). Big five personality variables and relationship constructs. *Personality and Individual Differences*, 37(7), 1519–1530. <https://doi.org/10.1016/j.paid.2004.02.019>
- Yap, M. B. H., Pilkington, P. D., Ryan, S. M., & Jorm, A. F. (2014). Parental factors associated with depression and anxiety in young people: A systematic review and meta-analysis. *Journal of Affective Disorders*, 156, 8–23. <https://doi.org/10.1016/j.jad.2013.11.007>

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