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Breastfeeding and Adult Personality

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Abstract

Five Factor Model (FFM) personality traits are implicated in long-term health-risk behaviors and outcomes. Less research has addressed how early-life experiences are associated with individual differences in these traits in adulthood. We examine whether having been breastfed is associated with adult personality and well-being in the National Longitudinal Study of Adolescent to Adult Health. At Wave 1, caregivers reported whether the target child had been breastfed. At Wave 4, participants ($N=13,113$; 53% female; $M_{age}=28.98$) completed measures of psychological functioning. We tested for mean-level differences in the traits by breastfeeding status (yes/no) and by the duration of breastfeeding, controlling for basic demographic factors and early-life factors that could confound the breastfeeding-personality association (e.g., mother education). Participants who had been breastfed scored lower in neuroticism, anxiety, and hostility and higher in openness and optimism than those not breastfed. A curvilinear relation suggested that neuroticism was lowest for those breastfed for 9–12 months and highest for those either breastfed for >24 months or exclusively bottle-fed. Breastfeeding was unrelated to conscientiousness or state psychological functioning. This research suggests long-term psychological benefits to breastfeeding and indicates that early life experiences are associated with traits that are consequential for adult health.

The personality traits that define the Five-Factor Model (FFM) of personality – neuroticism, extraversion, openness, agreeableness, and conscientiousness – are routinely implicated in health-risk behaviors and outcomes. Individuals high in neuroticism and low in conscientiousness, for example, are more likely to smoke (Terracciano & Costa, 2004), abuse substances (Sutin, Evans, & Zonderman, 2013), be obese (Magee & Heaven, 2011), and be physically inactive (Wilson & Dishman, 2015), which may account for their increased risk of morbidity (Chapman, Lyness, & Duberstein, 2007) and premature mortality (Terracciano, Löckenhoff, Zonderman, Ferrucci, & Costa, 2008). In addition to these two traits, individuals high in antagonism (i.e., low agreeableness) are at greater risk for cardiovascular morbidity (Sutin et al., 2010) and mortality (Klabbers, Bosma, van den Akker, Kempen, & van Eijk, 2013). These health correlates of personality are well documented; much less is known about the antecedents, particularly early-life antecedents, of these traits.

Personality traits emerge early in life and become relatively stable by early adulthood (Van den Akker, Dekovi, Asscher, & Prinzie, 2014). These traits are thought to have a biological basis that is rooted, in part, in the individual's genetics (McCrae & Costa, 2008). Indeed, behavioral genetics studies commonly estimate that up to 50% of the variance in adult personality can be attributed to genetics (van den Berg et al., 2014). In contrast to estimates from behavioral genetics, molecular genetics studies have found more modest genetic effects. To date, less than 1% of the variance in personality has been found to be associated with specific genetic variants (de Moor et al., 2012). Other biological factors may play a larger role in the development of the traits than genetics. Neonatal growth in the first months of life, for example, has been associated with fewer emotional problems in childhood (Smithers, Lynch, Yang, Dahhou, & Kramer, 2013) and greater Extraversion in adulthood (Lahti et al., 2013).

Early life experiences, either through biology or through experience, may be associated with the development of these traits. Eating is among the first behaviors that newborns engage in following birth, and many positive health-related outcomes have been linked with breastfeeding. Children who are breastfed, for example, are less likely to become obese, are less prone to infection, and have fewer respiratory problems (Ip et al., 2007). This protective effect of breastfeeding extends to other domains beyond physical health. Children who are breastfed for longer durations score higher on tests of cognitive functioning in young (Julvez et al., 2014) and middle (Belfort et al., 2013) childhood. Although mother's IQ and other family socio-demographic factors account for part of this relation, they do not account for all of it. The protective effect of breastfeeding may also not be limited to childhood; individuals who are breastfed continue to have more positive outcomes into young adulthood, including lower BMI (Fergusson, McLeod, & Horwood, 2014), less inflammation (McDade et al., 2014), and better cognitive functioning (Beaver, Vaughn, DeLisi, & Higgins, 2010).

There is also growing evidence that breastfeeding may be related to psychological functioning and adjustment. Children who are breastfed tend to have fewer behavioral problems at age 6 (Liu, Leung, & Yang, 2014), age 9 (Park et al., 2014), and age 14 (Oddy et al., 2010). Although some studies find that these associations are due to maternal characteristics, such as mother's age and education (Lind, Li, Perrine, & Schieve, 2014), others find that these associations persist even after accounting for such factors (Park et al., 2014). Similar to the physical and cognitive health benefits of having been breastfed, the protective effect on mental health may continue into adulthood. Individuals who had been breastfed report less psychological distress when measured in their 30s than individuals who had not been breastfed (Cable, Bartley, McMunn, & Kelly, 2012). And, although less research has addressed whether breastfeeding is associated with adult personality traits, as defined by the FFM, there is evidence that breastfeeding is associated with some FFM-related traits. In a large sample of adults from Finland, for example, those who had been breastfed scored lower in hostility-related traits than those who had been fed with a bottle (Merjonen et al., 2011).

The present study takes an intergenerational life-course perspective to examine whether breastfeeding is associated with *trait* psychological functioning in adulthood, defined as the characteristic ways of thinking, feeling, and behaving operationalized by the FFM. In

addition, given that there is some evidence that having been breastfed is associated with less psychological distress in adulthood (Cable et al., 2012), we also examine whether breastfeeding is associated with *state* psychological functioning defined as transient mood states (stress, depressive symptoms and well-being). Since breastfeeding tends to be protective against internalizing disorders in childhood (Liu et al., 2014) and adolescence (Oddy et al., 2010), we expect that adults who were breastfed will score lower in neuroticism and related traits, have fewer depressive symptoms, and have higher extraversion and well-being than adults who had not been breastfed. Likewise, based on previous research (Merjonen et al., 2011), we expect breastfeeding to be associated with less hostility and higher agreeableness. We construe the effect of breastfeeding on the other traits as exploratory. To examine whether there is a dose-response to breastfeeding or whether a single exposure at birth is sufficient for an association with personality, we test whether the duration of breastfeeding (none to more than 24 months) is associated with mean levels of the traits. Since some research has indicated that the association between breastfeeding and distress is limited to female offspring (Cable et al., 2012), we test whether there are sex differences in the association between breastfeeding and trait and state psychological functioning. We use a large national sample that has caregiver reports of breastfeeding and self-reported trait and state psychological functioning in young adulthood to test these hypotheses.

Method

Participants and Procedure

Participants were drawn from the National Longitudinal Study of Adolescent to Adult Health (Add Health). Participants in Add Health were recruited as a nationally representative sample of adolescents in the United States in grades 7–12 during the 1994–1995 school year. The fourth and most recent wave of data collection occurred in 2008–2009. This wave was the first to include a measure of personality traits (described below); other measures of trait and state psychological functioning were also available from this wave. As part of the initial assessment at Wave 1, when the participant was an adolescent, his/her caregiver completed questionnaires about the target child and family life.

A total of 13,113 participants had their caregiver's report of breastfeeding from Wave 1 and completed at least one of the psychological measures at Wave 4. Due to missing data on some variables, the analytic sample size ranged from 13,026 to 13,111. The pattern of results was identical when the analyses were restricted to only participants who had complete data on all psychological outcomes ($N=13,007$). The sample was, on average, about 29 years old ($M_{\text{age}} = 28.98$, $SD=1.73$; range 25–34 years old), 53% female, 63% European American, 20.1% African American, 4.4% Asian American, 1.1% Native American, 7.4% other races, and 4.0% biracial. The average level of education was some college ($M=14.57$, $SD=2.24$). Compared to the original Add Health in-home sample at Wave 1 ($n=20,745$), participants who had complete data at Wave 4 ($n=13,113$) were slightly younger at Wave 1 ($M_{\text{age}}=15.97$ ($SD=1.69$) versus 16.48 ($SD=1.73$); $F(1,20744)=2.67$, $p<.01$) and more likely to be female ($\chi^2=111.35$, $p<.01$) and white ($\chi^2=354.57$, $p<.01$).

Measures

Breastfeeding—During the Wave 1 assessment, the adolescent’s caregiver was asked, “For how long was [target adolescent] breastfed?” Response options were <3 months, 3–6 months, 6–9 months, 9–12 months, 12–24 months, >24 months, and not breastfed. For some analyses, the responses were dichotomized as any breastfeeding versus not breastfed.

Trait psychological functioning—At Wave 4, participants completed the Mini International Personality Item Pool (Mini-IPIP; Donnellan, Oswald, Baird, & Lucas, 2006). The Mini-IPIP is a 20-item measure of the five major dimensions of personality (i.e., neuroticism, extraversion, openness, agreeableness and conscientiousness) to use when time is limited. Each domain is measured with four items. Although the reliability tends to be lower than longer personality measures, the mini-IPIP has adequate reliability in young adult populations in general (Donnellan et al., 2006) and specifically in Add Health (Baldasaro, Shanahan, & Bauer, 2013) and likewise demonstrates adequate convergent and divergent validity with related constructs (Baldasaro et al., 2013; Donnellan et al., 2006). Anxiety and angry hostility were measured with 4 items each from the anxiety (e.g., I worry about things) and angry hostility (e.g., I get angry easily) subscales of the original IPIP (Goldberg et al., 2006). Optimism was measured with 4 items (e.g., I’m always optimistic about my future) from the Life Orientation Test-Revised (Scheier, Carver, & Bridges, 1994). All ratings were made on a scale that ranged from 1 (*strongly agree*) to 5 (*strongly disagree*) and were reverse coded such that higher ratings indicated greater agreement.

State psychological functioning—Perceived stress was measured with four items from the Cohen Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983). Items (e.g., In the last 30 days, how often have you felt that you were unable to control the important things in your life?) were rated on a scale from 0 (*never*) to 4 (*very often*). A short version of the Center for Epidemiological Studies Depression scale (Radloff, 1977) was used to assess depressive symptoms and well-being. Participants rated 5 items that captured the frequency of negative affect (e.g., sadness) and 3 items that captured the positive affect (e.g., happiness) felt within the last week. The items were rated on a 4-point scale from 0 (*rarely or never*) to 3 (*most or all of the time*) and scored separately as depressive symptoms and well-being.

Control variables—In addition to control variables that are known to be associated with psychological functioning in adulthood (participant sex, age, education, and race), we also included control variables associated with breastfeeding that may confound its association with psychological functioning: participant birth weight, mother’s education, household income during childhood, mother’s age, number of children in the family, and birth order (first versus latter born).

Analytic Strategy

We used analysis of covariance (ANCOVA) to examine whether there were differences in trait and state psychological functioning between participants who were breastfed (regardless of length) and those who were not breastfed. Each psychological measure was the dependent variable and breastfed (yes/no) was the between subjects factor. We ran the

ANCOVA twice, once controlling for basic demographic factors of the participants (i.e., participant sex, age, education, and race) and then again controlling for a wider range of factors that could account for the association between breastfeeding and adult personality and state psychological functioning (i.e., participant birth weight, mother's education, household income during childhood, mother's age, number of children in the family, and birth order). To examine whether there were mean-level differences by length of breastfeeding, we again ran the ANCOVAs with each psychological factor as the dependent variable, length of time breastfeeding as the between subjects variable (7 levels: none, <3 months, 3–6 months, 6–9 months, 9–12 months, 12–24 months, >24 months), and controlling for the demographic factors. Pairwise comparisons were used to examine whether any mean-level differences by duration were statistically significant.

Results

Of the Add Health participants who completed the Wave 4 assessment, 56% were not breastfed. Of the 44% who were breastfed, 33% breastfed for less than 3 months, 24% breastfed from 3–6 months, 16% breastfed from 6–9 months, 12% breastfed from 9–12 months, 12% breastfed from 12–24 months, and 3% breastfed for more than 24 months.

We first compared whether there were mean-level differences in psychological functioning between participants who had been breastfed (regardless of duration) versus those who were exclusively bottle-fed (Table 1). For the personality traits, participants who had been breastfed scored lower in neuroticism ($d = -.06$), anxiety ($d = -.06$), and hostility ($d = -.07$) and higher in openness ($d = .11$), agreeableness ($d = .03$), and optimism ($d = .08$). There were no differences between participants who were breastfed versus bottle-fed for extraversion ($d = .02$) or conscientiousness ($d = .00$) or any of the measures of state psychological functioning: perceived stress ($d = .00$), depressive symptoms ($d = -.01$), and well-being ($d = .00$). The results were nearly identical when the early life control variables (e.g., mother's education, only child) were also included in the analysis (Table 1). The one exception was that the difference between the two groups on agreeableness was reduced to non-significance; all other differences remained significant. The results for personality were also similar when controlling for the other traits, again with the exception of Agreeableness. None of these associations was moderated by sex, which indicated that the association between breastfeeding and differences in psychological functioning in adulthood were similar for men and women.

We next examined whether there were differences in psychological functioning by the length of breastfeeding (Table 2). For neuroticism, there was evidence of a curvilinear association between breastfeeding duration and mean-level of Neuroticism (Figure 1a): For each three month increase in the duration of breastfeeding, there were lower scores on Neuroticism until about 9–12 months when Neuroticism scores increased. Each duration of breastfeeding was associated with significantly lower Neuroticism compared to participants who had not been breastfed, with the exception of the longest duration of breastfeeding. Participants who had been breastfed for more than 24 months had similar mean levels of Neuroticism as those who had not been breastfed. For Openness, the only significant difference matched the analysis of none versus any breastfeeding: For each duration of breastfeeding, Openness

scores were higher compared to no breastfeeding, with some evidence that an extended period of being breastfed was associated with even higher Openness (Figure 1b). The mean differences by duration, however, were not significant. For anxiety, hostility, and optimism, the only differences to emerge were between not having been breastfed and all other durations of breastfeeding, but not between the breastfeeding durations. Similar to the dichotomous breastfeeding analysis, there were not significant differences by length of breastfeeding for perceived stress, depressive symptoms, or well-being.

Discussion

The present research used a large sample with caregiver reports of breastfeeding and psychological functioning measured in adulthood to identify the long-term psychological correlates of being breastfed. Participants who had been breastfed in infancy scored lower on traits related to negative emotionality (i.e., trait neuroticism, anxiety, and hostility) and higher on openness and optimism. These differences persisted even after controlling for socio-demographic factors that may confound the relation. There was no evidence that breastfeeding was associated with state psychological functioning, such as depressive symptoms or well-being.

Of note, we found no association between breastfeeding and adult conscientiousness, the most consistent personality predictor of health outcomes. Conscientiousness tends to be associated with similar health outcomes as breastfeeding: Individuals who are conscientious or breastfed tend to have lower BMI (Fergusson et al., 2014; Sutin, Ferrucci, Zonderman, & Terracciano, 2011), are less inflamed (Luchetti, Barkley, Stephan, Terracciano, & Sutin, 2014; McDade et al., 2014), and have fewer diseases (Ip et al., 2007; Sutin, Zonderman, Ferrucci, & Terracciano, 2013). Although both conscientiousness and breastfeeding are associated with better physical health, it appears that the relations are through different pathways. That is, Conscientiousness is not the mechanism that leads from breastfeeding to better health outcomes, but is rather an independent predictor.

The null relation between breastfeeding and extraversion was likewise surprising and counter to our hypothesis. The protective association of breastfeeding to emotional functioning may be limited to regulation of negative affect (i.e., lower neuroticism) rather than a core dispositional tendency toward positive emotions. Extraversion is a heterogeneous trait that encompasses gregariousness, positive emotionality, warmth, activity, and excitement seeking. Yet, the items that measure extraversion on the mini-IPIP solely reflect its gregariousness component. Thus it may be the case that breastfeeding is associated more with the optimistic, positive emotionality aspects of extraversion rather than the sociability component.

There was also no evidence that breastfeeding was associated with state psychological functioning in adulthood. This null finding was somewhat surprising since several studies have shown that breastfeeding is associated with fewer internalizing disorders in childhood (Oddy et al., 2010; Park et al., 2014). It is possible that better regulation of mood develops throughout childhood and becomes cemented as a trait by early adulthood. In this case, breastfeeding may be associated with stable psychological functioning (e.g., neuroticism)

but play less of a role in state fluctuations in mood (e.g., depressive symptoms) in adulthood. That is, state measures of mood are more sensitive to the daily fluctuations of emotional states, and it may be easier to predict a stable disposition rather than a mood state.

There are a number of mechanisms that may lead to the association between breastfeeding and adult trait psychological functioning. First, there may be direct biological mechanisms transmitted through the breast milk itself. Bioactive components in human milk, such as antimicrobial and anti-inflammatory substances, facilitate the development of the infant's immune system and reduce susceptibility to inflammation (Field, 2005; Hosea Blewett, Cicalo, Holland, & Field, 2008). And, indeed, breastfed individuals tend to have lower rates of infection and inflammation in childhood (Ip et al., 2007) and are less inflamed as adults (McDade et al., 2014). Given that inflammatory mechanisms have been implicated in the regulation of negative mood (Dantzer, O'Connor, Freund, Johnson, & Kelley, 2008), this mechanism may extend to the development of a trait disposition for negative emotionality. In a large meta-analysis, however, inflammatory markers (C-reactive protein and interleukin-6) were related to conscientiousness but not neuroticism (Luchetti et al., 2014). Still, the same meta-analysis found evidence that inflammatory markers were inversely related to Openness.

Other evidence suggests that early-life diet is associated with long-term personality development. For example, children who experience malnutrition, even when they grew up to be physically healthy adults, show differences in personality from age-matched controls: Adults who experienced malnutrition in their first year of life score higher in neuroticism and lower in openness, extraversion, and conscientiousness than adults who had not been malnourished as children (Galler et al., 2013).

Second, in addition to nutritional and biological factors, the psychological and social aspects of the experience of breastfeeding are also likely to play a role. Positive social interaction between caregiver and infant, regardless of breast milk, may be associated with more positive psychological outcomes. For example, although breastfed children have fewer internalizing behavioral problems, specifically less anxiety/depression and somatic symptoms, than children exclusively fed with a bottle, active bonding between the mother and child is also associated with fewer of these symptoms, regardless of how the child is fed (Liu et al., 2014). Thus, time spent with the infant, the gaze between mother and child, and verbal interactions promote positive psychological functioning independent of the biological compounds transmitted through the milk. Breastfeeding naturally promotes these behaviors, but bottle-feeding may also have similar effects, if paired with greater interaction with the infant. Mothers who breastfeed also show greater sensitivity to facial displays of emotion (Krol, Kamboj, Curran, & Grossmann, 2014) and have greater maternal sensitivity across the early years of their child's life (Papp, 2014). The development of the infant's temperament may be a correlate of this sensitivity – mothers who have greater maternal sensitivity tend to have children who score lower on negative affectivity at 18 months (Jonas et al., 2015). As such, mothers who breastfeed may be more attuned to their infants and help set them on a course for greater emotional stability throughout life. The present findings, however, also suggest diminishing returns of prolonged breastfeeding for emotional stability.

Stronger bonding may also encourage infants to explore and be creative because they have a safe, reliable base to return to, which may help promote the development of openness.

Third, breastfeeding may be a marker for other maternal or family characteristics associated with adult psychological functioning rather than the breastfeeding itself. Differences in mother's education or family income, for example, may account for some of the differences in outcomes between those who are breastfed and those who are bottle-fed (Lind et al., 2014). Although we controlled for many of the differences across families that have been implicated previously in breastfeeding, other factors could still confound this association. In family studies, when discordant siblings are compared (i.e., one was breastfed, the other not), common differences in outcomes often observed between breastfed and bottle-fed children are sometimes eliminated (Colen & Ramey, 2014). It is unclear, however, whether family differences between discordant and non-discordant siblings explain the discrepant outcomes.

Fourth, the decision whether to breastfeed or not may reflect characteristics of both the mother and child. Mothers who are emotionally stable, open, and conscientious, for example, are more likely to make the decision to breastfeed and are more likely to continue despite difficulties (Brown, 2014). Other personality characteristics of the mother, such as negative affectivity and general self-efficacy, are also associated with duration and early termination of breastfeeding (Ystrom, Niegel, Klepp, & Vollrath, 2008). Children of these mothers may be more emotionally stable and open because of shared genetics or because the mothers who choose to breastfeed are also the mothers who would raise their children to have these traits. In addition to the mother's personality, the temperament of the child may also influence breastfeeding. That is, a mother with a particularly difficult infant may resort to bottle-feeding if the child refuses to latch on or has other antagonistic behaviors that inhibit the initiation of breastfeeding.

The present findings suggest that breastfeeding is associated with some of the traits that predict important life outcomes. Thus, in addition to more positive physical and cognitive development, trait psychological functioning may be an additional long-term correlate of breastfeeding. In addition to the health benefits, the present research also indicates that early life factors are also associated with adult personality development, especially with regards to neuroticism, hostility, and openness. Either through physiological or social mechanisms, the behavior that the mother engages in has long-term implications for her child's psychological functioning in adulthood. At the same time, the mean differences were modest, which suggests that breastfeeding is just one factor associated with trait functioning in adulthood. Personality traits are complex, and any individual factor is likely to have only a modest effect.

The present study had several strengths, including a large sample, caregiver reports of breastfeeding, and multiple measures of psychological functioning in adulthood. Despite these strengths, there are some limitations that could be addressed in future research. First, we did not have any information on early caregiver interactions with the participant. Since active bonding may be as protective as breastfeeding against the development of internalizing symptoms, it would be useful in future research to examine whether such

effects are also observed for adult personality. We likewise did not have any information on the mother's personality. It would be important to have this information as mother's personality may confound the relation between breastfeeding and the child's personality. Second, we only had one assessment of personality. Multiple assessments of personality are needed to examine whether the association between breastfeeding and personality varies by age and whether having been breastfed is related to personality development over time. Third, the measure of personality, although well validated, was brief. The convenience of quick instruments come at the cost of lower reliability in estimating the association with the personality traits. A more comprehensive questionnaire would also be helpful for examining which specific facets of the broad domains are associated with having been breastfed.

There is growing recognition that early life factors can have a lasting effect on the individual's health (Gluckman, Hanson, Cooper, & Thornburg, 2008). Much of this theorizing and research has focused on the consequences of child adversity for physical health and mental disorders in adulthood (Shonkoff et al., 2012). Health-promoting behaviors early in life, such as breastfeeding, may help set the child on a long-term pathway toward better physical and mental health. The present research used an intergenerational life-course perspective to show that breastfeeding is associated with aspects of trait psychological functioning that are commonly implicated in adult health, which may be one mechanism that links early life experience to adult health.

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Figure 1A

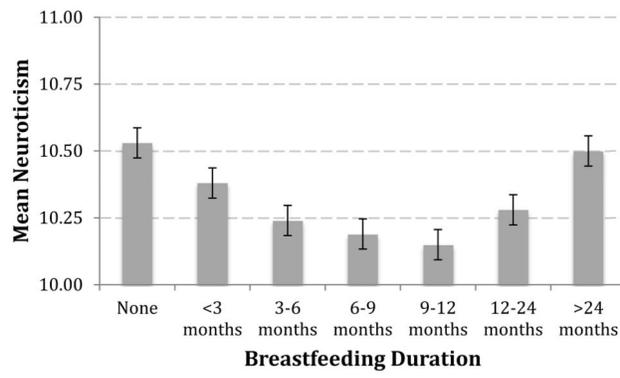


Figure 1B

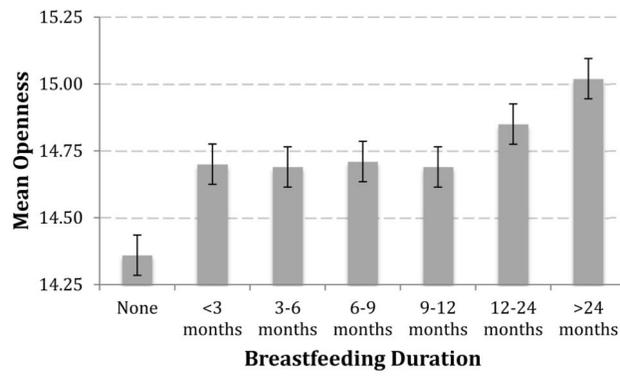


Figure 1.

Table 1
Mean-level Differences in Trait and State Psychological Functioning by Bottle versus Breastfed

Psychological Factor	Model 1			Model 2		
	Bottle	Breast	F	Bottle	Breast	F
Trait						
Neuroticism	10.53 (.03)	10.28 (.04)	25.95**	10.44 (.04)	10.20 (.05)	13.84**
Extraversion	13.20 (.04)	13.29 (.04)	2.39	13.22 (.05)	13.24 (.05)	.08
Openness	14.36 (.03)	14.73 (.03)	72.58**	14.35 (.04)	14.70 (.04)	36.25**
Agreeableness	15.22 (.03)	15.31 (.03)	4.96*	15.28 (.04)	15.36 (.04)	1.64
Conscientiousness	14.65 (.03)	14.63 (.04)	.16	14.61 (.05)	14.64 (.05)	.16
Anxiety	12.43 (.03)	12.19 (.04)	20.73**	12.43 (.05)	12.14 (.05)	18.03**
Angry hostility	10.31 (.03)	10.04 (.04)	26.14**	10.26 (.05)	9.98 (.05)	16.06**
Optimism	14.79 (.03)	15.05 (.03)	35.06**	14.84 (.04)	15.03 (.04)	10.72**
State						
Perceived stress	4.80 (.03)	4.81 (.04)	.05	4.68 (.05)	4.74 (.05)	.58
Depressive symptoms	2.63 (.03)	2.57 (.03)	1.55	2.54 (.04)	2.52 (.04)	.15
Well-being	6.69 (.02)	6.70 (.03)	.02	6.71 (.03)	6.71 (.03)	.00

Note. Ns range from 13,026 to 13,111. Estimated marginal means (standard errors) of psychological functioning by feeding type from analysis of covariance. Model 1 controls for participant age, sex, race, and education. Model 2 controls for these basic demographic factors and participant birth weight, mother's education, total household income, mother's age, number of children in the family, and birth order.

* $p < .05$.

** $p < .01$.

Table 2
Mean-level Differences in Trait and State Psychological Functioning by Breastfeeding Duration

Psychological Factor	Bottle	Breastfeeding Duration						
		<3 months	3–6 months	6–9 months	9–12 months	12–24 months	>24 months	
Trait								
Neuroticism	10.53 (.03) _a	10.39 (.06) _b	10.24 (.07) _b	10.19 (.09) _b	10.15 (.10) _b	10.28 (.10) _b	10.51 (.21) _{ab}	
Extraversion	13.20 (.04)	13.41 (.07)	13.25 (.08)	13.24 (.10)	13.17 (.12)	13.20 (.11)	13.43 (.24)	
Openness	14.36 (.03) _a	14.70 (.06) _b	14.69 (.06) _b	14.71 (.08) _b	14.69 (.09) _b	14.85 (.09) _b	15.02 (.19) _b	
Agreeableness	15.22 (.03)	15.29 (.05)	15.29 (.06)	15.37 (.08)	15.23 (.09)	15.41 (.09)	15.23 (.18)	
Conscientiousness	14.65 (.03)	14.66 (.06)	14.60 (.07)	14.70 (.09)	14.65 (.10)	14.52 (.10)	14.39 (.21)	
Anxiety	12.43 (.03) _a	12.37 (.07) _a	12.10 (.08) _b	12.12 (.09) _b	12.14 (.11) _a	12.09 (.11) _b	12.00 (.22) _a	
Angry hostility	10.31 (.03) _a	10.14 (.07) _{bc}	10.08 (.08) _{bc}	10.00 (.09) _{bc}	9.95 (.11) _{bc}	9.88 (.11) _{bc}	9.91 (.22) _{bc}	
Optimism	14.79 (.03) _a	15.02 (.06) _b	15.02 (.06) _b	15.11 (.08) _b	15.11 (.09) _b	15.06 (.09) _b	15.05 (.19) _b	
State								
Perceived stress	4.80 (.03)	4.91 (.07)	4.89 (.08)	4.77 (.10)	4.64 (.11)	4.60 (.11)	4.86 (.22)	
Depressive symptoms	2.63 (.03)	2.68 (.06)	2.62 (.07)	2.48 (.08)	2.42 (.10)	2.43 (.09)	2.59 (.20)	
Well-being	6.69 (.02)	6.63 (.05)	6.69 (.06)	6.76 (.07)	6.75 (.08)	6.83 (.08)	6.52 (.16)	

Note. *M*s range from 13.026 to 13.111. Estimated marginal means (standard errors) of psychological functioning by feeding duration from analysis of covariance that controls for participant age, sex, race, and education. Different subscripts within the same row differ significantly at $p < .05$. Rows without subscripts do not have any significant differences between the means.