

Can a Happy Relationship Predict a Happy Life? A Population-Based Study of Maternal Well-Being During the Life Transition of Pregnancy, Infancy, and Toddlerhood

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Published online: 12 December 2010

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Abstract The association between overall life satisfaction (LS) and relationship satisfaction (RS) was investigated longitudinally among mothers (N=67,355), using data from the Norwegian Mother and Child Cohort Study (MoBa), conducted by the Norwegian Institute of Public Health. Data were collected twice during pregnancy, and at 6 and 36 months postpartum. Satisfaction increased during pregnancy, with RS decreasing immediately following birth and LS showing an initial increase followed by a decrease postpartum. The results showed that LS and RS levels were quite stable over time (.46-.75), as was their cross-sectional associations (.42-.59). Structural equation modeling using a cross-lagged longitudinal model evidenced cross-concept cross-time effects for both LS and RS. The strengths of the cross-effects were asymmetrical and life-phase specific, with RS predicting change in LS more than LS predicted changes in RS during pregnancy and infancy. Having a satisfying romantic relationship is important for retaining and increasing future life satisfaction.

Keywords Life satisfaction · Relationship satisfaction · Subjective well-being · Parenthood · Pregnancy

1 Introduction

Most people around the world are found to be happy most of the time (Diener and Diener 2009), and being happy has been a human goal throughout history and across most, if not all, cultures. The recent and renewed interest in happiness and life satisfaction following

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the birth of positive psychology has resulted in numerous researchers attempting to discover the causes, correlates, and consequences of happiness (e.g. Argyle 1999; Kesebir and Diener 2008; Lyubomirsky et al. 2005), using different approaches.

One such approach which started decades ago explores how different life events affect life satisfaction. One of the earliest studies taking this approach found that satisfaction levels of people winning the lottery did not differ on average from that of accident victims (Brickman et al. 1978). These results led to what has later been referred to as the hedonic adaptation model, suggesting that most people have a tendency to adapt to their circumstances, returning to pre-event levels of well-being relatively quickly following an event (for more on adaptation, see Brickman and Campbell 1971; Diener et al. 2006; Lucas et al. 2003).

Even though life satisfaction judgments have been found to be relatively stable over time (Eid and Diener 2004; Schimmack and Oishi 2005), life satisfaction levels are subject to change (for a review of LS, see Fujita and Diener 2005; Pavot and Diener 2008). Experiencing certain negative life events, like divorce (Lucas 2005), unemployment (Lucas et al. 2004), or becoming disabled (Lucas 2007a) have been found to lastingly alter individuals' levels of life satisfaction.

Changes in life satisfaction following positive events are less studied. Researchers argue, however, that achieving the fulfillment of fundamental human motives will result in feelings of happiness (e.g. Lyubomirsky and Boehm 2010). One such fundamental motive is parenthood (Kenrick et al. 2010).

Pregnancy and childbirth is associated with numerous changes and new challenges, and the transition to parenthood has been shown to produce changes in the romantic relationship (e.g. Belsky and Rovine 1990; Levy-Shiff 1994; Twenge et al. 2003) and to negatively affect parental well-being (e.g. McLanahan and Adams 1987). Both cross-sectional studies and short-term longitudinal studies that have followed parents through pregnancy and up to 18 months postpartum have reported that children strain the parental relationship, resulting in decreased marital happiness following birth (e.g. Belsky 1985; Glenn and McLanahan 1982; Lawrence et al. 2008; Ruble et al. 1988; Twenge et al. 2003). Despite this overall decline in relationship satisfaction following birth, a few studies have found parents to experience a short period of increased satisfaction directly following birth, referred to as a "baby honeymoon" (see Harriman 1983; Hobbs 1968; Miller and Sollie 1980), followed by a subsequent decrease in satisfaction some weeks postpartum. A recent meta-analysis investigating changes in the marital relationship following the transition to parenthood, found that newlywed couples reported a decline in satisfaction in the years following marriage (Mitnick et al. 2009). For some couples this drop coincided with having children, for others not. Mitnick and colleagues concluded that the drop in satisfaction might not be specific for the transition to parenthood, but rather reflect a general trend found among all newly formed couples. In line with their finding, a longitudinal study of parents and non-parents found a decline in relationship satisfaction among non-parents as well as parents when they were followed for the first 8 years of marriage (Doss et al. 2009). However, Doss et al. showed that having children sped up the deterioration of relationship satisfaction, supporting the overall finding that having children negatively affects the marital relationship.

Results are less consistent regarding the effect of children on parents' overall life satisfaction. From a theoretical point of view, satisfaction is considered to reflect a comparison of what people have, to what they think they deserve, expect, or may reasonable aspire to (e.g., Campbell et al. 1976). Given that many young adults wants to have children (e.g. Hansen et al. 2009), theoretical deduction predicts that actually having children will

increase their life satisfaction. Furthermore, Kenrick et al. (2010) proposed parenthood to be a fundamental human need, and people are expected to feel happy after realizing fundamental needs (Lyubomirsky and Boehm 2010). Empirical analyzes of parenthood and well-being do not clearly support this prediction, however. Some studies have concluded that having children is costly for parents (e.g. Glenn and Weaver 1979; McLanahan and Adams 1987), while others have found parenthood to provide important rewards (e.g. Nomaguchi and Milkie 2003), and to be important for maintaining life satisfaction in a time of economic crisis (Rollero and Tartaglia 2009). One study even indicated that childbearing may have persistent positive effects on happiness (Kohler et al. 2005), and whereas a first-born child was found to be an important and direct source of well-being among mothers, additional children reduced their happiness levels (see Kohler et al. 2005; Twenge et al. 2003). Several studies also found the negative effect of children to be more pronounced for mothers than for fathers, with mothers reporting greater difficulty adjusting to parenthood (e.g. Belsky et al. 1985; Harriman 1983; Hobbs and Cole 1976). In sum, the results are mixed and inconclusive, and Lyubomirsky and Boehm (2010) therefore argue that more research is needed to understand the apparent paradox of parenthood.

1.1 The Association Between Overall Life Satisfaction and Relationship Satisfaction

Data on the association between LS and RS is limited and inconclusive. Two cross-sectional studies investigating the relationship between overall life satisfaction and domain satisfaction reported that satisfaction with the domain partner/marriage affected overall life satisfaction (Lance et al. 1989; Lance et al. 1995), whereas another study reported that LS and RS bi-directionally influenced each other (Headey et al. 1991). One study found changes in life satisfaction to be systematically related to changes in marital satisfaction (Heller et al. 2006), suggesting that a good marital relationship is important for overall life satisfaction (e.g. Glenn 1975; Glenn and Weaver 1979, 1981; Hawkins and Booth 2005).

Most previous studies have used a cross-sectional design, however, and do not permit exploration of the dynamics of well-being over time. It is quite likely that the relationship between LS and RS is life-cycle or life-event dependent. The romantic relationship may for example be particularly important for overall satisfaction at certain periods of life, while playing a lesser role at other times. Alternatively, the relationship between LS and RS may be constant, suggesting that being satisfied with the relationship is equally important for experiencing high life satisfaction during major life transitions as they are during less eventful periods in life. Use of longitudinal data including multiple and frequent measurement points may provide important insights into the dynamics of life and relationship satisfaction over time.

2 The Current Study

While previous studies have quite consistently found that the parental relationship (defined as i.e. marital quality or marital satisfaction) suffers as children enter the union, information about the interrelationship between relationship satisfaction and overall life satisfaction across an extensive period of time, and across a period of major change—such as the birth of a child—is lacking. Additionally, the majority of studies that have investigated the effect of children on parental life and relationship satisfaction were published in the 1970s and -1980s, with most being based on American samples. New evidence is therefore needed to establish how life satisfaction and relationship satisfaction is related among

parents who are having children in the twenty-first century, and in non-US samples. The American findings may not generalize to findings obtained from other nationalities, and data from the Nordic countries has been requested to establish how children affect parents, as social policies in these countries seem to positively influence the effects of parenthood on satisfaction (Hansen et al. 2009).

With this background, the purpose of the present study was twofold. First, in wanting to gain knowledge about how satisfaction judgments change as women experience pregnancy, infancy, and toddlerhood, the absolute average change in both LS and RS was explored as mothers went through this life transition. Throughout the paper we have used the terms life/relationship satisfaction judgments and life/relationship satisfaction levels interchangeably, both referring to the women's subjective experience of how satisfied they are with their life or relationship. We hypothesized that satisfaction judgments would be moderately but negatively affected by childbirth, and to change across time. Secondly, we explored the mutual relation between LS and RS across time using a cross-lagged design to determine whether current levels of LS/RS predicted future changes in RS/LS, respectively. We also examined whether the strength of such cross-effects between LS and RS was dependent on the life-phase the women experienced: pregnancy (week 19 and 30), infancy (6 months postpartum), or toddlerhood (36 months postpartum).

The present study is unique in several respects. Most previous studies investigating the transition to parenthood have used cross-sectional designs or short-term longitudinal studies (with a follow-up period of up to 18 months). The present investigation uses data from a large longitudinal study, including data from four time-points collected over a period of 3.5 years. The size of the sample also distinguishes it from other studies. Participants include a large population based sample, with more than 60,000 mothers included in the first assessment, which, to our knowledge makes it the first and the largest single study to directly investigate the relationship between life satisfaction and relationship satisfaction longitudinally.

3 Method

3.1 Sample and Procedures

3.1.1 Norwegian Mother and Child Cohort Study (MoBa)

The present investigation used data from the Norwegian Mother and Child Cohort Study (MoBa), conducted by the Norwegian Institute of Public Health (NIPH), which was approved by the Regional Committee for Medical Research and the Norwegian Data Inspectorate. In brief, MoBa is a pregnancy cohort started in 1999, with 100,000 pregnant women recruited by 2008. Most pregnant women in Norway were invited to participate, with a response rate around 45%. Expecting mothers were recruited through a postal invitation as they were scheduled for a routine ultrasound examination offered around 18 weeks of gestation (www.fhi.no/tema/morogbarn). After returning the informed consent, participants completed three questionnaires during pregnancy (Q1 at the time of recruitment, Q2 at week 22, and Q3 at week 30), as well as three questionnaires after birth (Q4 at 6 months, Q5 at 18 months, and Q6 at 36 months postpartum). No compensation is given for participation (for further detail about the MoBa, see Magnus (2007); Magnus et al. (2006)).

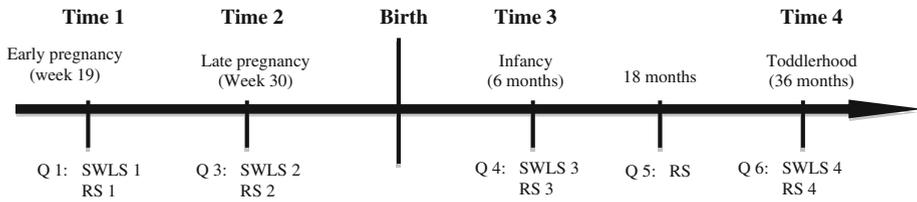


Fig. 1 Data-collection points with relevant scales in the Norwegian Mother and Child Cohort Study (MoBa)

The current study had access to data from participants recruited between 1999 and 2005, and the data file used is created from the NIPH data delivery of April 2007. We used data from questionnaires Q1, Q3, Q4, and Q6, hereafter referred to as Time 1 (recruitment), Time 2 (pregnancy week 30), Time 3 (6 months postpartum), and Time 4 (36 months postpartum), respectively (see Fig. 1 for details). Due to the nature of the MoBa and the continued data collection and registration process, the number of women included at the different time points varied, with 67,355 women included at Time 1 (Q1), 63,314 at Time 2 (Q3), 51,739 at Time 3 (Q4), and 15,267 at Time 4 (Q6), respectively.¹ As such, the difference in number of data-entries at each wave is not primarily due to attrition, but rather to the continuous enrollment, resulting in participants reaching the data-collection points at different times. During pregnancy, the response rate was between 92 and 95%, while it dropped to 87% at Q4 and 77% at Q5 (Magnus et al. 2006).

In addition to the MoBa questionnaire data, two variables (the mothers' age and number of previous children) were added to the file from the Norwegian Medical Birth Registry (MBR). The MBR was established in 1967 and contains standardized information regarding all pregnancies from 16 weeks of gestation in Norway (for details on MBR, see Irgens 2000).

Mean maternal age at the time of birth was 30.0 years ($SD = 4.6$), and 42% were expecting their first child. Over the total length of the study, approximately 96% reported being in a stable relationship, with 50% reported being married and 47% co-habitants just prior to birth (Time 2). In terms of education, 36% of the mothers had completed high school or the equivalent, 41% held a 4-year undergraduate university or vocational degree, while 20% held a graduate degree. Nine percent were students at the time of pregnancy. The participants represent a culturally homogenous group, with only 7% reporting either themselves or their partner to have another language than Norwegian as their first language. Participants in the current study have been found to be somewhat older, with more living in stable relationships, than the average Norwegian mother (Nilsen et al. 2009).

3.2 Measures

3.2.1 Life Satisfaction (LS)

The Satisfaction With Life Scale (SWLS) was used to measure overall life satisfaction (Diener et al. 1985; Pavot and Diener 1993). This five-item scale includes items such as

¹ In addition to the full file consisting of all participants, a smaller data file was created, including a panel of women ($N = 14,519$) who were recruited early in the study and had completed all questionnaires (Q1, Q3, Q4, and Q6). Basic analyses were performed on both the full sample and the panel sample, and results were practically identical. Thus, the full sample was used in all further analyses.

“The conditions of my life are excellent” and “I am satisfied with my life”, rated on a 1–7 Likert scale (1 = *Strongly Disagree*, 7 = *Strongly Agree*). Individual mean satisfaction scores were computed and used in the analyses. The scale had good internal consistency, with Cronbach’s alphas of .89, .89, .89, and .91 estimated at Time 1, 2, 3, and 4, respectively.

3.2.2 Relationship Satisfaction (RS)

Relationship satisfaction was measured using the five-item Relationship Satisfaction scale (Røysamb et al. 2010), which was developed for the MoBa study based on previously constructed scales, i.e. the Marital Satisfaction Scale (Blum and Mehrabian 1999). Røysamb et al. (2010) found that the RS scale shows good psychometric properties, correlating .91 with the Norton’s (1983) established Quality Marriage Index, QMI, demonstrating high convergent validity. The RS scale refers to “partner” rather than being limited to marital spouses, and includes the items “I am satisfied with the relationship with my partner”, “My partner and I have problems in our relationship”, “I am very happy in my relationship”, “My partner is generally understanding”, and “We agree on how children should be brought up”. Responses are rated on a six-point Likert scale from *Strongly Disagree* to *Strongly Agree*. The RS scale had good internal consistency, with Cronbach’s alphas of .85, .86, .87, and .90, at Time 1, 2, 3, and 4, respectively.

3.3 Attrition

We used the complete data-file in our analyses, and wanted to make sure any missing data was due to chance. To investigate selective attrition, a survival analysis with Cox regression was performed. Time in the study was measured from T1, and event was defined as dropping out between T1 and T4. LS and RS were included as covariates to estimate the hazard ratio for attrition due to initial scores on these two main variables. Hazard ratios were .984 ($p = .04$) for LS and .993 ($p = .16$) for RS, indicating virtually no selective attrition due to initial level of LS and RS. Data were thus considered consistent with the missing at random assumption, and structural equation modeling (SEM) analyses were performed with the full information maximum likelihood procedure.

3.4 Choice of Analytic Strategy: Structural Equation Modeling

To enable an investigation of stability and change in LS and RS over time, across pregnancy, infancy, and early toddlerhood, SEM was the preferred analytic strategy, and cross-lagged longitudinal models were tested in Mplus (Muthén and Muthén 2006). The cross-lagged longitudinal model was chosen to enable a complex analysis including both variables (LS and RS) across multiple time-points, including within-concept cross-time effects (e.g. LS at T1 and T2), cross-concept within-time relations (e.g. LS and RS at T2), and cross-time cross-concept effects (e.g. LS at T1 influencing RS at T2). Using SEM rather than other, simpler analyses (like regression or correlation), a complex investigation of how multiple variables affected each other simultaneously across multiple time-points was possible, enabling us to explore the complex interplay between LS and RS across time.

To fully examine the interrelation between LS and RS across time, several models were tested, from the simplest to the most complex one. In model 1, autoregressions within each time span for both LS and RS were included (e.g. RS2 regressed on RS1, corresponding to

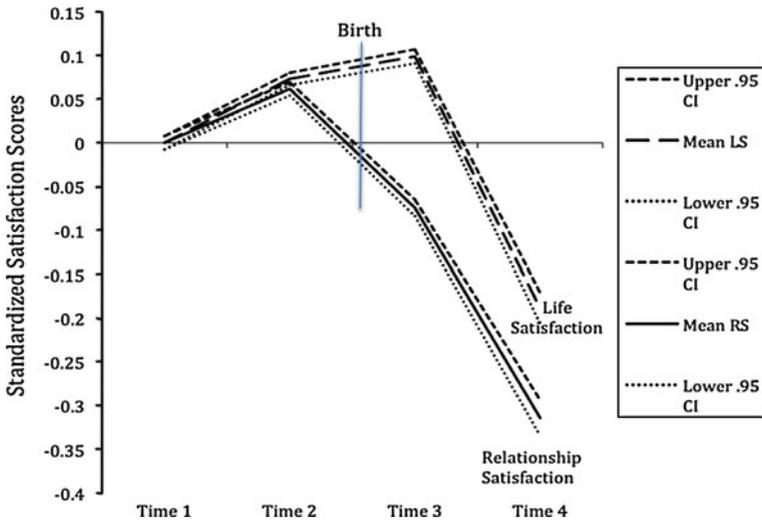


Fig. 2 Standardized satisfaction scores with 95% confidence intervals. Life satisfaction: $N = 66,673$ (T1), 62,853 (T2), 51,152 (T3), and 13,215 (T4). Relationship satisfaction: $N = 63,617$ (T1), 62,117 (T2), 50,174 (T3), and 13,821 (T4)

a simplex structure). A correlation between LS and RS at T1 and between their residuals at T2–T4 was also included in model 1. The correlated residuals represent the concurrent covariation between LS and RS not accounted for by previous levels (i.e. co-occurring change). In model 2, long-term effects within variables (e.g. the effect of LS1 on LS3 and LS4) were tested. In the final model 3, cross-effects between LS and RS over time were added (see Fig. 4 for the third and full model).

To interpret the results, the root mean square of approximation (RMSEA), the comparative fit index (CFI), as well as the Tucker-Lewis Index (TLI) were used, as these are the fit indices suggested utilized when interpreting results (Bollen and Curran 2006; Hoyle 1995). These fit indices reflect discrepancy between the model and the observed data. Good fit (low discrepancy) is indicated by CFI and TLI values above .95, and RMSEA values below .05. Also, we used chi-square differences tests to compare nested models.

4 Results

4.1 Initial Analyses

Addressing our first question of how LS and RS changed over pregnancy, infancy, and toddlerhood, mean satisfaction scores were computed. Life satisfaction scores ranged from 5.42 to 5.73 (on a 1–7 scale) and mean relationship satisfaction scores ranged from 4.99 to 5.27 (on a 1–6 scale) across the 3.5 years of the study (see Table 1).

To investigate the absolute increase or decrease in satisfaction across this life transition (our first aim), scores were standardized based on the T1 scores, and paired-samples t tests were conducted. As seen in Fig. 2, life satisfaction increased with almost .1 standard deviations during pregnancy and infancy to reach its highest level at Time 3, 6 months postpartum, with $t(49,817) = 20.02, p < .001$. During the phase of toddlerhood (T3–T4),

Table 1 Descriptive statistics for life satisfaction and relationship satisfaction across time

| Time | Life satisfaction | | | Relationship satisfaction | | |
|------|-------------------|------|------|---------------------------|------|-----|
| | <i>N</i> | Mean | SD | <i>N</i> | Mean | SD |
| 1 | 66,673 | 5.62 | 1.08 | 63,617 | 5.22 | .74 |
| 2 | 62,853 | 5.70 | .97 | 62,117 | 5.27 | .71 |
| 3 | 51,152 | 5.73 | .99 | 50,174 | 5.17 | .79 |
| 4 | 13,215 | 5.42 | 1.12 | 13,821 | 4.99 | .90 |

Mean Life Satisfaction (measured by SWLS) at Time 1, 2, 3, and 4, and mean relationship satisfaction (RS) at Time 1, 2, 3, 4

Table 2 Correlations between life satisfaction and relationship satisfaction across time

| | LS 1 | LS 2 | LS 3 | LS 4 | RS 1 | RS 2 | RS 3 | RS 4 |
|------|------|------|------|------|------|------|------|------|
| LS 1 | 1 | | | | | | | |
| LS 2 | .56 | 1 | | | | | | |
| LS 3 | .53 | .60 | 1 | | | | | |
| LS 4 | .46 | .51 | .59 | 1 | | | | |
| RS 1 | .42 | .42 | .43 | .36 | 1 | | | |
| RS 2 | .37 | .48 | .46 | .37 | .75 | 1 | | |
| RS 3 | .33 | .39 | .58 | .42 | .63 | .67 | 1 | |
| RS 4 | .29 | .32 | .40 | .59 | .49 | .50 | .56 | 1 |

All p 's < .001; LS = life satisfaction measured by the Satisfaction With Life Scale (SWLS); RS = relationship satisfaction; 1 = Time 1 (week 17, early pregnancy); 2 = Time 2 (week 30, late pregnancy); 3 = Time 3 (infancy, 6 months postpartum); 4 = Time 4 (toddlerhood, 36 months postpartum)

life satisfaction dropped almost .3 standard deviations ($t(12,774) = -38.91, p < .001$), ending up nearly .2 standard deviations below initial Time 1 satisfaction levels; $t(12,994) = -22.30, p < .001$ at Time 4. Relationship satisfaction, on the other hand, while increasing slightly during pregnancy ($t(58,557) = 16.79, p < .001$), started to decrease almost immediately following birth, dropping more than .3 standard deviations from late pregnancy (T2) to 3 years postpartum ($t(13,407) = -43.81, p < .001$; see Fig. 2).

An exploration of the relative stability and change in LS and RS across the study showed that the autocorrelations for LS were smaller and less stable across time than the autocorrelations for RS, ranging from .46 to .60 for LS versus .49 to .75 for RS, respectively (see Table 2). Across time, concurrent LS and RS rating increased, from a correlation of .42 at Time 1 to .59 at Time 4. This suggests that satisfaction with life changed more across time than satisfaction with the relationship, and that satisfaction with life and with the relationship were more highly related as time passed.

Our second purpose was to explore the mutual relations between LS and RS across time. We therefore tested a simple regression model, using LS and RS scores obtained at Time 1 and Time 4, controlling for T1 effects when predicting T4 effects. As Fig. 3 indicates, satisfaction judgments were relatively stable over time, with β 's of .37 and .44, for LS and RS, respectively (p 's < .001). This initial regression model indicated that RS at Time 1 contributed more to overall LS 3.5 years later ($\beta = .21, p < .001$), than overall LS at Time

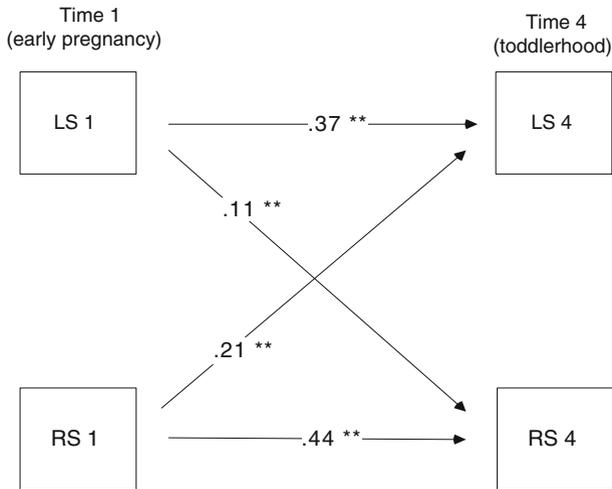


Fig. 3 Overall regression coefficients between life satisfaction and relationship satisfaction measures at Time 1 and Time 4, $** p < .001$

1 contributed to later RS ($\beta = .11, p < .001$). Thus, these results suggested that having a satisfactory relationship was more important for overall well-being measured 3.5 years later than overall well-being was for future relationship satisfaction.

4.2 Structural Equation Models

To further explore the mutual relations between LS and RS across time, five models were tested using a cross-lagged structural equation model, run with Maximum Likelihood procedures in Mplus. Of these five models, we refer to the first three as main models as they progressively include all major variables of the model. We refer to the last two models as follow-up models as these two models were tested to attempt to specify the relationship between RS and LS across time, comparing it to the third, best-fitting main model. Thus, all five models were tested using the same procedures; we just refer to these models as main and follow-up models to distinguish between the purposes of testing them.

In the first, main model, LS and RS at all time points were used. Stability coefficients (the effect of LS1 on LS2, LS2 on LS3, LS 3 on LS4, and the same for RS), and cross-concept correlations (the correlation between LS and RS at T1, and between the residuals of LS and RS on subsequent time points), were included. The correlations between LS and RS residuals at T2–T4 reflected the associations between LS and RS after controlling for previous levels of both measures, and provide evidence of co-occurring change. The first model did not fit the data well; $\chi^2(18) = 17887.82, p < .001$; CFI = .895, TLI = .843, and RMSEA = .119.

In the second main model, long-term within-variable coefficients (e.g. the effect of LS1 on LS3 and LS4) were added to the first model. This second model provided a significantly better fit to the data, but did not represent the data well enough; $\chi^2(12) = 8819.89, p = .000$; CFI = .948, TLI = .884, and RMSEA = .102. We therefore tested a third, full model in which cross-concept cross-time effects (the effects between LS and RS) were added (see Fig. 4). Overall, this full main model fitted the data very well, and significantly better than the second model tested; $\chi^2(6) = 289.00, p = .000$; CFI = .998, TLI = .993,

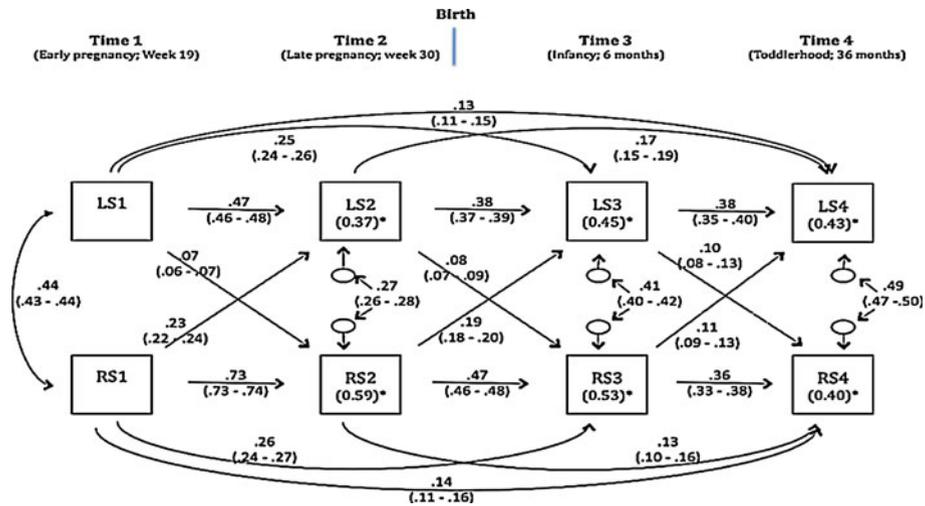


Fig. 4 Full main Mplus model with coefficients, and 99% confidence intervals. Tests of model fit yielded $\chi^2(6) = 289.00, p = .000$; CFI = .998, TLI = .993, and RMSEA = .026. All p 's < .001. * Explained variance

and RMSEA = .026. Similarly to the results from the simple regression model depicted in Fig. 3, the stability of LS across time was lower than that of RS, except between Time 3 and Time 4. In general, the stability of both satisfaction judgments decreased as the time span between measurement points increased; β 's decreased from .73 (.47) during pregnancy, to .47 (.38) during infancy, to .36 (.38) during toddlerhood, for RS (and LS), respectively; all p 's < .001. In addition to the stability found between subsequent time-points, long-term effects across the 3.5-year duration of the study was found (all p 's < .001). More of the variance in RS is explained than in LS (except at Time 4), with R^2 being .59, .53, and .40 for RS at Time 2, 3, and 4, and R^2 being .37, .45, and .43 for LS at Time 2, 3, and 4, respectively.

Significant and partially substantial cross-effects between LS and RS were found across all time points, all p 's < .001 (see Fig. 4 for details). To investigate the nature of these cross-effects (i.e. how LS and RS affected each other more specifically across time), two additional models were tested. In the first of these two follow-up models, we tested whether LS was an equally strong predictor of RS as RS was of LS across all time points (from Time 1 to Time 2, Time 2 to Time 3, and Time 3 to Time 4), by restricting all cross-concept, cross-time effects to be equal. This first follow-up model fitted well, but significantly worse than the third, full main model in Fig. 4; $\chi^2(9) = 1,718.17, p < .001$; CFI = .990, TLI = .970, RMSEA = .052, $\Delta\chi^2(3) = 1,479.17, p < .001$. The interrelationship between LS and RS during this life transition seems to be asymmetrical, with RS contributing more to LS than LS contributed to RS.

In the final (and second follow-up) model we tested whether the contribution of LS → RS and RS → LS was constant across time (thus, whether the effect of LS1 on RS2 was equal to the effect of LS2 on RS3 and LS3 on RS4), by constraining the relationship to be constant (in magnitude) over time. This model also fitted very well, but significantly worse than the best-fitting model—the third main model in Fig. 4; $\chi^2(10) = 483.60, p < .001$; CFI = .997, TLI = .993, RMSEA = .026, $\Delta\chi^2(4) = 194.60, p < .001$.

5 Discussion

The purpose of the present study was to investigate how mothers' life satisfaction and relationship satisfaction changed and inter-correlated through a substantial life transition represented by pregnancy, infancy, and toddlerhood.

Overall, Norwegian mothers were highly satisfied with their life throughout the duration of the study. In fact, they were more satisfied than most other samples studied, including Norwegian women being in a relationship (mean LS 5.4) (Clench-Aas et al. 2009), and adult samples from England (mean LS 4.8), Holland (mean LS 5.4), and Australia (mean LS 5.0), as well as Spanish (mean LS 4.9) and Japanese (mean LS 4.2) students, psychiatric patients (mean LS 4.0) and Holocaust survivors (mean LS 4.7) (reported by Pavot and Diener 2008). The high satisfaction levels found among Norwegian mothers may be affected by the social policies and maternal benefits provided, including free health care and a 1-year governmentally sponsored maternity leave. These benefits probably make the prospect of parenthood and childbirth less stressful and economically straining than in countries not providing such benefits. The effect of social benefits on maternal satisfaction was not the focus of investigation in this study, but should be addressed in future studies to gain an understanding of how external factors and specific social policies may influence and possibly ease major personal life transitions.

Overall, mothers reported increased LS as the birth approached, lasting until 6 months postpartum, after which their overall life satisfaction dropped. This finding is in accordance with previous research reporting increased happiness in the weeks following birth, which has been referred to as a "baby honeymoon" period (see Crawford and Unger 2000; Hobbs 1968; Harriman 1983; Miller and Sollie 1980). From 6 months postpartum and onward, life satisfaction dropped, reaching its lowest level 3 years postpartum. Despite this drop, our participants were still happier than most other samples investigated (e.g. Clench-Aas et al. 2009; Pavot and Diener 2008).

The current results provide support for a general decline in both LS and RS following birth. However, the life transition of pregnancy to parenthood seems to be comprised of several phases. During the phases of pregnancy and infancy, LS and RS developed differently. Overall life satisfaction increased during pregnancy and infancy, and started to decline during the toddler phase. Relationship satisfaction showed an initial increase during pregnancy, followed by a decrease during infancy, which continued through the toddler years (see Fig. 2). The finding that the drop in RS (at T2) is followed by a subsequent drop in LS (at T3) provides support for our finding that RS is predictive, and possibly imperative, for later LS.

An important aim of the study was to explore how satisfaction levels were interrelated and developed over time. Overall, being satisfied with the relationship, whether this was with the father of the child or a more recently formed partnership, positively predicted overall life satisfaction during the transition, which is consistent with several previous studies (Glenn and Weaver 1981; Lance et al. 1989; Mallard et al. 1997). The present study extended these previous findings however, by indicating that the RS–LS relationship changed across time, with RS being more important as a predictor of LS during the transitory period of pregnancy, birth, and infancy than later, during toddlerhood. Whereas the association between LS and RS was found to be asymmetrical during pregnancy and infancy, a more symmetrical association between LS and RS was indicated during toddlerhood (see Fig. 4). Specifically, the relationship with ones partner seem to be of particular importance for overall satisfaction during the early transitory phase of pregnancy to infancy. This raises the question of whether such an effect can also be found during other

life transitions; whether there are other periods in life characterized by great change in which the relationship is of particular importance for the maintenance of overall well-being. This needs to be explored in future studies.

Our findings show that having a satisfactory relationship is predictive of a future happy life. Women who were satisfied with their relationship during pregnancy were more satisfied with life 3 years later than those who were less satisfied. As the romantic relationship have been shown to suffer as a new member enters the family, interventions aiming to promote a robust and satisfactory relationship during this life transition may be valuable. For example, preparatory classes or public messages to prospective parents that focus on the importance of nurturing their relationship and building social support may counteract the decline in satisfaction commonly characterizing this period.

Even though some of the current findings replicate previous results, they extend existing knowledge exploring how LS and RS are associated over time. Our study is the first and largest to investigate these cross-concept effects longitudinally in a modern welfare state, and discovering their interrelatedness as well as the ability to predict future life satisfaction is an important finding. Knowing the effect of a good relationship on future life is important for legislators and politicians, as well as for potential parents, as they wish to affect or enhance individual satisfaction and happiness levels. Furthermore, stable relationships are important for obtaining good mental health among parents as well as children, and as such, encouraging couples to build and maintain a strong relationship seems vital for living a future happy life.

5.1 Limitations and Directions for Future Studies

The present study is unique in its longitudinal nature and size, enabling us to answer a number of important questions. Nevertheless, several limitations exist and need to be mentioned.

First, the results displayed in Fig. 2 encourage a speculation of whether the depicted decline in satisfaction represent (1) a true drop following childbirth, as has been found in previous studies (e.g. Glenn and McLanahan 1982; Twenge et al. 2003), suggesting that the addition of children to the family actually adversely affect parents. Alternatively, the decline may represent (2) a normal development following partnership formation or marriage (as suggested by Mitnick et al. 2009), which is similar to (3) adaptation effects (that the effect of life events are temporary, as people tend to adapt to both negative events like divorce (Lucas 2005) and disability (Lucas 2007a), and positive life events like marriage (Lucas and Clark 2006; Lucas et al. 2003) and the birth of a first child (Dyrdal and Lucas 2010). The results obtained in the present study resemble reaction and adaptation effects. Reaction and adaptation studies show that people report increased satisfaction levels as they anticipate a positive event, with satisfaction returning to pre-event levels relatively quickly following the event (Dyrdal and Lucas 2010; Lucas and Clark 2006). Thus, the increased satisfaction found in our study during pregnancy may represent time-specific reaction effects, which artificially create elevated satisfaction levels as a mother anticipates the birth of her child. Following birth, the decrease in satisfaction may represent a return to pre-pregnancy levels, rather than representing an absolute decline in satisfaction. Alternatively, the drop in satisfaction may represent a true drop, resulting from the constrained freedom and additional responsibilities acquired by the mother following childbirth. Previous research supports both interpretations, as adaptation effects show similar patterns of change (Lucas 2007b), and overall satisfaction as well as marital satisfaction has been found to decrease following birth (e.g. Belsky 1985; Kohler et al. 2005).

This limitation could have been remedied by recruiting participants prior to becoming pregnant. The lack of pre-pregnancy measures of satisfaction restrict the conclusions drawn from this study, as the question of whether the observed declines are absolute or reflect adaptation to the event can not be completely resolved.

Secondly, as fathers in many countries are becoming increasingly more involved with the baby and family after delivery, with extended paternity leave (especially in Scandinavia) and shared household responsibilities, future studies may benefit from including responses from fathers. This would yield more complete information about how the parental relationship is affected during such major transitions. Data from fathers would enable researchers to contrast and compare how mothers and fathers experience the transition, and how their satisfaction levels influence each other across time.

The present study yielded a unique opportunity to study how life satisfaction and relationship satisfaction was associated across time. Because of the huge changes taking place in the partner relationship during early parenthood, analyses of RS and changes in RS seems particularly relevant in this phase. However, since the participants are in this very specific period of their lives, care must be taken in generalizing the results to every phases of a partnership life cycle.

As the response rate in the MoBa was lower than optimal (45%), and satisfaction scores obtained were relatively high, a question of whether the results do reflect the full range of experiences among expecting mothers can be raised. Furthermore, participants in the current study have been found to be somewhat older, with more living in stable relationships, than the average Norwegian mother. Despite these potential biases, no effect has been found on the association between variables in the MoBa sample as compared to the general Norwegian population (Nilsen et al. 2009), thus the present study provides important evidence regarding how life satisfaction and relationship satisfaction is related over time. Nevertheless, a higher participation rate is greatly encouraged in future studies.

Another related limitation is the cultural homogeneity of participants in the present study. As participation is voluntary, the questionnaires are lengthy, and no compensation is provided, some disadvantaged groups or minority populations may be precluded from participating. Some of these groups may provide important information on the value of children, and how culture and social integration may affect satisfaction levels, and targeting these groups when recruiting participants may be particularly important.

Even though mothers reported a decrease in both overall satisfaction and satisfaction with the relationship over this transition, couples continue to have children. It is a common belief that people will strive to obtain things in life that maintain or even increase their satisfaction, rather than things that lower their well-being. The counterintuitive finding regarding having children may signal to researchers that important aspects of life that are affected as couples have children have not been thoroughly assessed. Thus, a consideration should be made regarding the scales and measures used to ensure that the potentially powerful and profound ways in which having children can positively affect a parent's life is being captured. In future studies, including good measures to detect these effects in addition the commonly used satisfaction scales (e.g. SWLS; Diener et al. 1985) will be an important and valuable task (Lyubomirsky and Boehm 2010).

Despite these limitations, the birth of a child is believed to be a happy event, and the present study show that Norwegian mothers are among the happiest individuals studied today. The reasons for this may be many, but at a societal level, the availability of free healthcare and almost one full year maternity leave probably make the prospect of having children less stressful than in countries where these benefits are not equally available. Furthermore, being in a satisfying relationship is shown to be important for sustaining high

well-being during this life transition. Nevertheless, data still show that having a child is associated with decreased satisfaction, and if becoming happier is the goal, actively engaging in happiness-inducing activities (Lyubomirsky 2007; Lyubomirsky et al. 2005) and maintaining your romantic relationship may be more fertile than changing your life circumstances by having children.

Acknowledgments The donations of questionnaire data and biological material from MoBa participants are gratefully acknowledged. The Norwegian Mother and Child Cohort Study is supported by the Norwegian Ministry of Health, NIH/NIEHS (grant no N01-ES-85433), NIH/NINDS (grant no.1 UO1 NS 047537-01), and the Norwegian Research Council/FUGE (grant no. 151918/S10).

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