Gender differences of social interactions and their effects on subjective well-being among Japanese elders

Abstract

Objectives—Gender differences of social interactions and their effects on subjective well-being among Japanese elders over three years were examined.

Methods—Repeated measurements of 498 elders over a three-year survey interval were obtained from a baseline mail survey and two- and three-year follow-up surveys. Outcomes were analyzed using Hierarchical Linear Modeling.

Results—Male elders were more likely to have a spouse and work at paid jobs, while female elders were likely to have more frequent contacts with their child/children and more interactions with friends. As the elders aged over three years, life satisfaction decreased, while depression did not show any significant overall trend. There were no beneficial effects of social interactions on change in well-being, although social participation, interaction with friends, and conversation with spouse were beneficially related to baseline levels of both depressive tendency and life satisfaction. Among female elders only, the number of children had beneficial effects on life satisfaction.

Conclusions—There are modest gender differences of the impact of social interactions on the well-being of Japanese elders, and the number of children seems to be more important as potential sources of support for female rather than male elders. Spousal conversation and non-obligatory social interaction such as unpaid social activities and friendship seem to be important for both male and female elders in Japan. These findings suggest that social relations among Japanese elders may be moving away from more gender dependent patterns seen in the past.

Keywords

subjective well-being; growth curve modeling; temporal change; social interaction

Introduction

Twenty-five years after House and colleagues (1988) reviewed the major extant findings on the links between social relationships and health, their concluding words about the need to "further understand" these processes still obtain. The purpose of this study is to examine gender differences of several sources of social interactions on subjective well-being over three years among Japanese elders. In addition, we examine trajectories of subjective well-being over three years.

Japan and other East Asian countries are often considered to be characterized by a collectivist orientation rather than more individualist orientations said to be found among Western countries (Kitayama, Markus, & Kurokawa, 2000). East Asian countries have historically been influenced by Confucianism, as evidenced by a preponderance of traditional norms governing household divisions of labor, high gender income gaps (the difference between median earnings of men and women relative to median earning of men is 33% in 2006; OECD, 2010), low representation of women in national politics (12% of parliamentarians are women in 2010; UNDP, 2010), and other areas.

Such traditional norms typically stress filial piety and paternal hierarchical family relations. Thus, in Japan, women are more likely to take caregiving roles and to be more tightly bound to their families than men. Although these cultural tendencies have been weakening due to recent influences of globalization, urbanization, and other factors, these traditions are still strongly rooted in Japanese society, especially among elders. Many commentators, therefore, believe that the effects of social and family relations on well-being are greater in Japan than in Western countries. For example, Koyano, Hashimoto, Fukawa, Shibata, and Gunji (1994) found that family centrality was important in the social support system of Japanese elderly. That is, Japanese elders feel that family members living together are the most dependable, followed by children living apart, and that neighbors and friends are less dependable. While there seem to be mostly supportive relationships among family members living together, there were also negative effects found in these types of families, especially among multigenerational households in one East Asian country in particular, Korea (Jeon, Jang, Rhee, Kawachi, & Cho, 2007). However, recent contradictory findings by Fiori, Antonucci, and Akiyama (2008) directly compared social relations using elderly samples from the U.S. and Japan. They found that while elders in functionally or structurally restricted social network types in the U.S. had higher depressive symptomatology than those in other types of networks — such as diverse, friend-focused, or family-focused — surprisingly there were no differences in depressive symptomatology by network type in Japan. They suggested that "because in Japan relationships may be viewed as predetermined or obligatory, rather than constructed or voluntary, the Japanese may learn to be happy with whatever network they have (Fiori et al., 2008, p. 223)." However, if they examine effects of each source of social interaction, not examining the effect of network types, they would find beneficial effects on well-being in Japan, as reported by other commentators (Okabayashi, Liang, Krause, Akiyama, & Sugisawa, 2004), and their explanations would not be considered complete. There appears to be additional need to explore the relationship between social relations and subjective well-being in Japan.

In a more historically oriented way, Iwao (2008) described typical gender-segregated lives in the Japanese generation born before World War II. During early adulthood and midlife, "even though the constitution declared that men and women were equal, male and female roles gradually become established according to which it was the men who worked and earned the salaries and the women who stayed at home and devoted themselves to the housework and childrearing (pp. 532)." In old age, "this generation of Japanese men and women had lived in completely separate worlds over many years, without showing their real feelings to each other. The women had built up close relationships with their children and female friends, and one can even say that sometimes the children took on the role of the absent father. The wider the gulf between husband and wife become, the closer she grew to the children (pp. 536)." Iwao's narrative suggests that while elderly women in Japan enjoy interacting with friends and adult children but tend to avoid their "useless" husbands (sometimes even called "large rubbish"), elderly men become lonely after retirement because they do not have strong emotional bonds to their wives and children and wider social networks (such as friends) in their community. Is this really true? Do Japanese male elders really experience such a sad life?

In a recent U.S. longitudinal study, Kendler and colleagues (2005) found that "emotionally supportive social relationships are substantially more protective against major depression for women than for men," but there are few empirical longitudinal studies examining gender differences in well-being among Japanese elders. Therefore, the purpose of this study is to examine gender differences of several sources of social interactions on subjective well-being over three years among Japanese elders. We believe that elderly women are more likely to have a more diverse network, including children or friends, than elderly men. We also believe that while male elders are likely to be influenced by the relationships with their

spouses, female elders are likely to be influenced by other relationships such as with children or friends, rather than with their spouses.

In addition, we examine trajectories of subjective well-being over three years. Over time, subjective well-being among elders tends to decrease with functional health (House, Lantz, & Herd, 2005). However, the rate of decline may not be the same among all elders. That is, for some elders subjective well-being may be relatively stable, while for others it may dramatically decrease. We examine whether social interactions were related to the change rates of subjective well-being over a three year period among Japanese elders, and we also examine whether there are gender differences of these effects on well-being.

We will next review the relationship of each source of social interaction with subjective well-being among elders. To capture social interaction from various sources comprehensively, we measure three different aspects of these interactions thought to be among the most important (Cohen,Underwood, & Gottlieb, 2000; Lubben & Gironda, 2003): family relationships, social participation, and interactions with friends. For elders, family relationships typically refer to those with spouses and adult children. Social participation usually refers to participating in paid work, or unpaid structured social activities in senior centers or volunteer centers. Interactions with friends or one's spouse constitute informal relations and companionship, which are different from formal relationships such as volunteer activities, which also often convey public meaning beyond the privacy of the dyad.

Relationship with spouses

The spousal relationship seems to be one of the most important sources of social support among elders (Bookwala & Franks, 2005; Okabayashi, et al. 2004). However, though negative impacts of conjugal bereavement are commonly observed (Carr, 2004; Strohschein, McDonough, Monette, & Shao, 2005; Wu & Hart, 2002), widows/widowers typically recover on standard measures of mental health after about a year (Okabayashi et al., 1997), and their health is not necessarily worse than married people (Strohschein et al., 2005). Recent findings by Hughes and Waite (2009) suggest that changes in marital status are also often not associated with long-term deleterious effects on some dimensions of health, such as depressive tendency. These findings suggest that marital quality and marital activities may be more important than the marriage per se.

There are a few empirical studies that explicate gender differences of the relationship between marital relationships and subjective well-being. Antonucci and Akiyama (1987) found that relative to male elders female elders had more emotional interactions with their children and friends and fewer interactions with their husbands in the U.S. It is interesting that even in the U.S. where the relationship between husbands and wives are usually said to be more equal than in Japan, male elders rely on their spouses more heavily than do female elders. Antonucci and Akiyama (1987) also found while female elders who were satisfied with their husbands showed greater happiness, those male elders did not. Male elders were beneficially influenced by their friendships. This result was somewhat contradictory because while happiness among male elders relying heavily on wives was not affected by marital satisfaction, happiness among female elders not relying on their husbands was affected by marital satisfaction. According to these authors, the reason why there was no relation between marital satisfaction and happiness among male elders was because of the small variance of marital satisfaction. However, it may also be ascribed to the gender differences of social expectations of traditional gender roles. That is, even if male elders were satisfied with high levels of support from their wives, they might not appreciate it as much and might not feel quite as happy because they consider such support as relatively mundane or simply part of the "background." On the contrary, even if female elders receive a relatively modest

amount of support from their husbands, they would be very happy because they did not expect much support from their husbands to begin with.

In Japan, Tsuchikura (2005) found that in middle-aged couples, husbands rated seven indicators of marital quality (marriage, spouse, attractiveness of spouse, happiness of spouse, sexual life, pleasantness with spouse, and consolation with spouse) higher than wives did. Then, she found that the amount of time spent having pleasant conversations with one's spouse was related to marital quality, but only among wives, not husbands. Although she did not directly examine the relation between marital quality and subjective well-being, her findings suggest a positive association. So, according to these two studies above, in both Japan and the U.S., male elders rated their relationships with their spouses higher in quality than female elders. But in both Japan and the U.S., well-being was likely to be positively affected by one's spouse only in the case of female elders.

Relationships with adult children

For elders, adult children also seem to be an important source of social support. Characteristics of the relationship with their adult children include the number of children, physical proximity to their domicile (or, although becoming less common in Japan than in years past, co-residence), frequency of contact with their children, and the type of social support offered by this relationship, such as emotional or instrumental.

In terms of co-residence with children or the number of children, Silverstein, Cong, and Li (2006) found that in rural areas in China, where co-residence is still common, living with children and grandchildren fostered psychological well-being for grandparents, while living with children only did not. One important reason for this is that in the former environment elders receive greater financial and emotional support from adult children than do those in the latter. Silverstein et al. (2006) also found that the number of children had beneficial effects on psychological well-being among older parents in rural China. Cheng and Chan (2006) found in China that there was no effect of co-residence with children on filial discrepancy between elders' expectations and actual supportive behavior from children. In the U.S., Byers, Levy, Allore, Bruce, and Kasl (2008) found that there was no effect of the number of children on depressive tendency among middle-aged and older people. In Spain, Zunzunegui, Béland, and Otero (2001) found that elderly widows/widowers who were not living with their children showed higher levels of depressive tendencies than those living with their children. One cross-national study between the U.S. and Japan found that the presence of adult children was associated with fewer depressive tendencies among elders in Japan only, and this effect was significantly stronger among those who were unmarried as opposed to those who were married (Sugisawa, Shibata, Hougham, Sugihara, & Liang, 2002).

In terms of social support from adult children, Okabayashi et al. (2004) also found that emotional support from adult children had beneficial effects on the mental health of older parents in Japan, especially among those without spouses. Cheng and Chan (2006) found that in China, adult children's respect for their elderly parents was beneficially related to elders' well-being. In Spain, Zunzunegui, Béland, and Otero (2001) found that emotional support from children played an important role in maintaining the physical and mental health of elders. In the U.S., Byers et al. (2008) found that adult children's reliance on instrumental support from their middle- and old-age parents — and the corresponding parental perception of the adult child's gratitude — appeared to make the parents feel themselves useful and was associated with fewer depressive tendencies among the parents.

Interactions with friends

Friendships are typically more enjoyable and burdened with fewer obligations than family ties (Lee & Shehan, 1989). Though emotional support from friends was not related to elders' well-being in a national representative sample in Japan (Okabayashi et al., 2004), this finding may be incidental to measurement limitations; the net effect of friends may not have been detected because the "friends" category included not only friends but also relatives other than spouses or children. Lee and Shehan (1989) indicated that interactions with friends in a U.S. sample tended to bolster feelings of self-worth, while interactions with family members failed to have a similar effect. The reason behind the beneficial effects of friendship on self-worth is that friends tend to make intimate and joyful relations without the obligations that relationships with family members and participation in formal organizations may involve. Fiori, Antonucci, and Cortina (2006) also found that among five types of social networks (nonfamily-restricted, non-friends, family, diverse, and friends), depressive tendencies were highest for elders in non-friends networks, and lowest for individuals in diverse networks in the U.S.

Social participation

Participating in formal organizations is another way to cultivate interpersonal relationships. It is different from informal relationships like friendships and family relationships because the extra-individual (i.e., institutional) component can help construct and maintain a larger sense of meaning, which, in turn, may contribute more to elders' self-esteem than do informal relationships.

Social activity in formal organizations was divided into two categories: employed jobs and unpaid activities. Most Japanese companies adopt a mandatory retirement system and most workers have to retire from their full-time jobs once they approach the age of 60. After that, they can live on their public or private pension and savings, and some continue to work as part-time workers. This working style for elders is sometimes called "bridge employment" (Feldman, 1994). Jobs seem to be one of the sources from which not only monetary support but also social interactions and support are derived. However, in case an elder has to work due to financial need, jobs may not have the same beneficial effects on mental health. Alternatively, elders may be participating in unpaid activities such as at senior centers or volunteer centers. Their participation in these activities is often considered to be among the most voluntary and non-obligatory types of social interaction.

In the U.S., Hao (2008) showed that participants of multiple occupational and volunteer activities enjoyed a slower rate of mental health decline than single activity participants among middle-aged or older people aged 55 to 66. In particular, full-employment and low-level volunteering had an independent protective effect against declines in psychological well-being. An empirical study of the effects of social participation on life satisfaction among national elderly representative samples aged 60 or older in Japan and the U.S. (Sugisawa & Akiyama, 2001) found that while participation in community activities had positive effects on life satisfaction among all but female elders in the U.S., participation in paid jobs did not have any significant effects on their life satisfaction in either country, even after controlling for the degree of financial poverty. A recent national representative survey of people aged 55 to 64 in Japan (Sugihara, Sugisawa, Shibata, & Harada, 2008) found that men engaging in more hours of paid or volunteer work was related to lower levels of depressive tendency, while for women, none of the social participation activities (paid work, volunteer work) were found to be independently linked with depressive tendency. On the other hand, for Japanese females, engaging in multiple roles such as volunteer activities with unpaid housework, in comparison with doing only housework, was related to lower depressive tendency. Some contradictions between two Japanese studies about the effects of

paid jobs among men suggest that paid jobs may be more attractive to middle-aged men under 60 years old than male elders over 60 years old. Nevertheless, unpaid volunteer activities seem to be beneficial for older adults both in Japan and the US.

Current research

In our review, although several types of social interaction among elders appear to be beneficial to various components of mental health, it is not clear whether each source is independently beneficial to temporal changes in subjective well-being over time. To the extent of our knowledge, few or no studies have focused on trajectories of subjective well-being among Japanese elders using three-wave panel data. The purpose of this study is to clarify gender differences of various social interaction types and their effects on subjective well-being over three years among Japanese elders. For our purposes, we analyze elders who had been married or those who had been in widowhood/divorced over our three-year survey interval with at least one adult child.

Hypotheses

As noted above, findings in the literature are somewhat contradictory, especially about gender differences of effects of social interactions among Japanese elders. However, we make tentative hypotheses to make clear our line of thought in this study. We start with the idea that a greater diversity in the sources of social interaction should be beneficial for elders (Fiori et al., 2006). And, while male elders are likely to rely heavily on their spouse as a source of interaction, female elders have a more diverse network consisting of children, friends, and other social activities (Iwao, 2008). The following five hypotheses are created.

1. First, subjective well-being would decline over three years among all elders, although there would be interindividual variability in the change rates (House, Lantz, & Herd, 2005). In addition, male elders would decline more rapidly than female elders because female elders are likely to live longer than male elders.

2. Second, elders having frequent conversations with their spouses would enjoy higher levels of well-being and would thus enjoy greater stability than those having infrequent conversations with their spouses or those without spouses (Tsuchikura, 2005). In addition, these effects would be greater among husbands than among wives, because male elders have been shown to be more dependent on their spouses than female elders (Iwao, 2008), although there are contradictory results in the literature showing beneficial spousal relations among only female elders (Tsuchikura, 2005; Antonucci & Akiyama, 1987).

3. Third, elders living with the emotionally closest adult child, or those living apart from the closest adult child but having frequent contact with him/her, would enjoy greater subjective well-being and enjoy more stability than those having infrequent contact with him/her (Sugisawa et al., 2002; Okabayashi et al., 2004; Zunzunegui et al.,2001; Byers et al., 2008). In addition, the number of adult children would have beneficial effects on subjective well-being among elders (Silverstein et al., 2006). Then, although there are few Japanese studies examining gender differences of the effects of children on elders, these effects would be greater for female elders than male elders because female elders are more likely to have built stronger emotional bonds with their children during their adulthood than males.

4. Fourth, more interactions with friends would be related to higher subjective well-being and a more stable rate of change among elders (Lee & Shehan, 1989; Fiori et al., 2006). Although there are few Japanese studies examining gender differences of effects of friends, female elders are more likely to be influenced by their

friendships than males because female elders would be more likely to place more weight on other sources of support besides spouses.

5. Fifth, elders participating in unpaid social activities (Sugisawa & Akiyama, 2001) or working at paid jobs (Hao, 2008; Sugihara at al., 2008) would enjoy higher levels of well-being and enjoy more stability than those not participating in these activities or than those without jobs. Female elders are more likely to be beneficially influenced by unpaid social activities because female elders would place more weight on other resources of support besides their spouses, while males are more likely to be beneficially influenced only by paid jobs (Sugihara et al., 2008) because of a lifetime history of acclimation to paid work as an obligation.

Methods

Participants

In this study, 1,360 older adults aged 64 to 80 years were randomly sampled from 20,301 people listed on an electoral registry in Hino City, a suburban area in Tokyo, in October 2002 using sampling with probability proportionate to size (PPS). A mail survey was first conducted with them in November 2002, from which 634 valid responses were collected. Two years later in November 2004, the first follow-up survey was conducted with these 634 elders, and 431 valid responses were collected. Then, one year later in November 2005, a second follow-up survey was conducted with the 431 elders, and 364 valid responses were collected.

In terms of networks of spouses and children, the following groups were excluded because of insufficient sample sizes: those who had never married (n=5), those whose marital status changed from married to widow/widower over the three years (n=11), and those who had no children (n=34). An additional 86 cases having missing values in variables to be analyzed were excluded. As a result, at the initial survey, 498 responses from elderly persons who had been married or who had been in widowhood/divorce over our three-year survey interval, with at least one child were analyzed. Due to subject drop-out, the number of valid responses decreased to 330 in the survey conducted two years after baseline and to 284 in the three year survey, although with the modeling approach used here, we are able to use data from all 498, 330, and 284 persons respectively.

Measurement

Subjective well-being—Subjective well-being consists of two components: satisfaction with life and positive affect (Diener, 1984). In this research, we used life satisfaction and depressive tendency measures, respectively, for those constructs. Although depressive tendency is one of many aspects of mental health, they also seem to be considered affective components of subjective well-being as opposed to positive affect. Life satisfaction was measured using 10 items selected from the 20-item Life Satisfaction Index-A (LSI-A) developed by Neugarten, Havighurst, and Tobin (1961). Each item asked about whether the participants were satisfied about their own life or not and rated in 3 response categories: 3 (agree), 2 (not sure) and 1 (disagree). Higher scores denote greater psychological well-being. Cronbach's alpha coefficients were .755, .738, and .712 in the initial survey and those conducted two and three years later, respectively.

Depressive tendency was measured using 11 items of an abbreviated version (O'Hara, Kohout, & Wallace, 1985) of the Center for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1977). Each item asked about how often one experienced different kinds of depressive tendency during the past week and was rated in 3 response categories: 3 (frequently), 2 (sometimes), and 1 (not at all). Higher scores denote greater psychological

distress. Cronbach's alpha coefficients were .796, .799, and .736 in the initial survey and those conducted two and three years later, respectively.

Relationship with spouse—The spousal relationship was measured by the following question: "How frequently do you enjoy conversations with your spouse?" There were three alternatives: "often," "sometimes," and "almost never." We categorized the first choice as elders having "frequent" conversations, and the last two choices as elders having "infrequent" conversations. Two dummy variables were created. One variable was whether elders have frequent conversations with their spouses. The other was whether elders have infrequent conversation with their spouses. Widows/widowers/the divorced were set as a reference category for both.

Relationship with children—The number of children was measured and considered to be one of the potential sources of support. In addition, the quality of elders' relationships with their emotionally closest child was measured. The following two questions were asked: "Do you live with the emotionally closest child?" Second, "If you live apart from the closest child, how often do you communicate with him/her (by phone, letters, and visits)?" The relationship with the closest child was divided into three categories: elders living with the closest child, those living apart from the closest child but maintaining frequent exchanges (greater than or equal to two communications a month) with him/her, and those living apart from the closest child and maintaining infrequent exchanges (less than or equal to one contact a month) with him/her. Two dummy variables were created. One variable was whether or not elders living apart from the closest child had infrequent contact with the closest child (less than or equal to once a month). The other variable was whether elders living apart from the closest child had frequent communication (more than or equal to twice a month). Elders' living with the closest child was set as the reference category.

Friendship—The frequency of contact with intimate friends was measured by the following question: "How often do you communicate with your intimate friends by phone, visits, or letters? (If you have multiple intimate friends, please mention the total number)." In this case, "intimate" friends were defined as those to whom elders could open their hearts and express what was on their minds and what they were concerned about. The following six response alternatives were scored from 0 to 5: "never" (or elders without any intimate friends), "less than once a month," "once a month," "two or three times a month," "once a week," and "more than twice a week."

Social participation—Two variables were used to measure social participation: one was participating in a "circle or senior center club" and another was participating in "community activities such as volunteer activities." Three alternatives were scored from 1 to 3: "almost never," "sometimes," and "often," respectively. The scores of both variables were added and the combined score was used as an indicator of social participation. Cronbach's alpha coefficient was .646 at baseline.

Job status was measured as a dummy variable that indicated whether elders were: working = 1 or not working = 0.

Demographic variables—Gender was used as a dummy variable, where male = 1 and female = 0. Age was measured simply in years. Subjective health was measured with the following four alternatives: "poor," "somewhat poor," "fair," and "good," scored from 1 to 4, respectively. Subjective economic status was measured with the following four alternatives: "marginal," "somewhat marginal," "somewhat affluent," and "affluent" scored from 1 to 4, respectively.

Models of analysis

Growth curve modeling was used to plot the temporal trajectories of life satisfaction and depressive tendency among Japanese elders and to predict variance in these trajectories attributable to different sources of social interaction. We used the Hierarchical Linear Modeling, Version 6 (HLM6), software of Raudenbush and Bryk (2004), to estimate the parameters of these growth models.

HLM has several distinct advantages that address challenges inherent to the analysis of dependent data from repeated measurements. The Level-1 model estimated a growth trajectory in each domain of subjective well-being (life satisfaction and depressive tendency) for each individual in the sample based on repeated measurements over three years. Thus, for each domain of subjective well-being, each individual's trajectory was summarized by a set of growth parameters. The values (e.g., an intercept and a slope that represent change over time) of these parameters vary across individuals and can be used as outcomes in Level-2 analyses. Variation in growth can be predicted from a set of specific person-level variables. In HLM, the multiple observations on each individual are viewed as nested within the person. This treatment of multiple observations as nested allows the investigator to proceed without difficulty when the number and spacing of time points vary across cases (Raudenbush & Bryk, 2002). An unconditional (no predictor) model is presented as follows:

$$\text{Level 1:} \quad \text{subjective well-being}_{ti} = \beta_{0i} + \beta_{1i}\textbf{TIME}_{ti} + r_{ti}$$

$$\text{Level 2:} \quad \begin{aligned} I2_{0i} &= I3_{00} + u_{0i} \\ I2_{1i} &= I3_{10} + u_{1i} \end{aligned}$$

subjective well-being$_{ti}$ = subjective well-being at the time of measurement *t* of person *i*;

TIME$_{ti}$ = time of measurement *t* of person *i*,

I2$_{0i}$ = intercept, level of well-being at the initial survey of person *i*;

I2$_{1i}$ = slope, change rate of well-being per one year of person *i*;

r_{ti} = residual at time *t* of person *i*;

$I3_{00}$ = grand mean of intercepts of the total sample;

$I3_{10}$ = grand mean of slopes of the total sample;

u_{0i} = random effect of person *i* on intercept of well-being; and

u_{1i} = random effect of person *i* on slope of well-being.

HLM methods also allow us to proceed with analysis even though there are missing respondents or responses across the longitudinal data collection. Therefore, we analyzed all valid responses from our participants who had been married or had been in widowhood/divorce over the three years with at least one child: 498 at Wave 1, 330 at Wave 2, and 284 at Wave 3. A variable of years passed since Wave 1 was created. Responses in Wave 1, Wave 2 and Wave 3 were scored 0, 2, and 3 respectively. The coefficient of slope in this study means the change of well-being over 1 year.

To test our central hypothesis, the model included eight person-level predictors of different sources of social interaction: working, degree of social participation, interaction with friends, number of children, two dummy variables for intimate children, two dummy variables for frequency of conversation with spouse. Then, we added gender and its

interaction terms with all of these social network variables. In addition, we include three demographic variables: age, subjective health status, and subjective economic status as control variables. All the values of predictor variables were measured at the initial survey because this study focused on the linear growth curve of subjective well-being and time-invariate effects of social interactions.

Results

Gender differences of all the variables at the initial survey (N = 498) are shown in Tables 1 and 2. Male elders were more likely to have a living spouse and be employed, while female elders are more likely to have frequent contacts with their friends. Although there was a significant difference of relationship with spouse by gender, this is likely reflected by the fact that female elders are more likely to lose their spouse than male elders, and the proportion of elders having frequent conversation with spouse was not substantially different by gender. That is, if we exclude widows or widowers, the proportions of those having frequent conversation with spouse were 47.7 % for males and 44.3 % for females. Female elders were more likely than male elders to co-reside with their child or to have frequent contacts with their child living apart. In addition, the gender composition of this sample at each wave was almost the same: The rates of male elders were 55.2% (male 275, female 223), 55.2% (male 182, female 148), and 54.9% (male 156, female 128), at Wave 1, Wave2 and Wave 3 respectively.

Hierarchical linear modeling was conducted on a repeated unbalanced data set over three time points. All variables except for the dummy variables were centered by subtracting their mean values. In terms of depressive tendency, the results of the unconditional model showed that while there was a significant fixed effect of the level (β_0 = 15.62, p < .001), there was no significant fixed effect of the slope (β_1 = .066, p = .219), indicating no overall change of depressive tendency over the three years. In addition, the reliability estimates (λ) of the random level 1 coefficients of level and slope were .717 and .182, respectively. We also found significant random effects on both intercept and the slope for depressive tendency (τ_{00} = 8.895, p < .001; τ_{11} = .198, p = .005). The correlation between the level and slope of depressive tendency was negative and large (r = −.543). Since there was significant variance of both level and slope of depressive tendency among individuals, effects of various social interaction and their interaction with gender on well-being can be estimated.

In the full model, all social relations, their interaction terms with gender, and control variables were included as independent variables. Their effects on the level and slope of depressive tendency were estimated. Non-significant paths were deleted one by one from its slope to intercept and from higher-order to lower-order interaction terms. In HLM, the equation of slope consists of interaction terms between given variables and time (Raudenbush &Bryk, 2002). In terms of this order of deleting variables, we followed the general rule that if there were higher order terms in a regression equation, we shouldn't omit their lower order terms (Aiken & West, 1993, p. 61). The variables consisting of significant higher-order interactions were not deleted, even if the lower-order term consisting of those variables were not significant. Finally, a reduced model was obtained (Table 3). The reduced model is better than the full model in terms of parsimony because the relative goodness of fit of the reduced model (model deviance = 5300.690, number of parameters = 19) was not significantly worse than that of the full model (model deviance = 5269.143, number of parameters = 46; $\chi^2(27)$ = 31.547, *NS*) and the effects of predictors are not substantially different from the full model. To the level of depressive tendency at baseline, after controlling for health and economic status, social participation (γ = −.371, p = .045), interaction with friends (γ = −.231, p = .003), and the number of children (γ = −.578, p = .033) were negatively related. Including two dummy variables for conversation with spouse

into this model showed significant improvement ($\chi^2(2) = 19.961$, p < .001), and elders having infrequent conversations with their spouses had higher levels of depressive tendency ($\gamma = .731$, p = .031) than those without a spouse or those having frequent conversations with their spouses (Figure 1).

Regarding the slope of depressive tendency, there was a significant interaction of gender with the number of children ($\gamma = -.298$, p = .028). Figure 2 shows that female elders with more children (2.86, the mean value plus 1 SD) had lower depressive tendency at the initial survey but depression increased over the course of this study, while those with fewer children (1.36, the mean minus 1 SD) showed a relatively high and steady level of depressive tendency. On the other hand, for male elders, there was no effect of the number of children.

In terms of life satisfaction, the results of the unconditional model showed that there was a significant fixed effect of its level ($\beta_0 = 21.996$, p < .001) and slope ($\beta_1 = -.161$, p = .005). In addition, the reliability estimates (λ) of the random level 1 coefficients of level and slope were .686 and .022, respectively. It also showed that while there was a significant random effect of its intercept ($\tau_{00} = 9.596$, p < .001), there was no random effect of its slope ($\tau_{11} = -.024$, p > .500). The correlation between level and slope of life satisfaction was negative and relatively small (r = −.138).

Because there was a significant variance in the level of life satisfaction among individuals, the effects of various sources of social interaction on satisfaction was estimated. In a full model, all the variables and their interaction terms with gender were included as independent variables and their effects on the level of life satisfaction were estimated. Non-significant paths were deleted one by one from higher-order to lower-order interaction terms. The variables consisting of significant higher-order interaction were not deleted, even if the lower-order term consisting of those variables was not significant. Though there was a marginal effect in the second-to-final model (not shown) suggesting that elders having infrequent contact with the closest child showed a lower level of life satisfaction than those living with him or her ($\gamma = -0.779$, p = .029), the two dummy variables of the amount of contact with the closest child living apart from the elders were deleted because the total effects did not reach a significant level ($\chi^2(2) = 5.298$, p = .069). So we deleted these two variables from the equation. Finally, a reduced model was obtained (Table 4). The reduced model is better than the full model in terms of parsimony because the relative goodness of fit of the reduced model (model deviance = 5483.010, number of parameters = 15) was not significantly worse than the one of full model (model deviance = 5471.134, number of parameters = 26; $\chi^2(11) = 11.876$, *NS*) and the effects of predictors are not substantially different from the full model. To the level of life satisfaction at baseline, after controlling for health and economic status, social participation ($\gamma = .695$, p = .001), interaction with friends ($\gamma = .204$, p = .014), and the number of children ($\gamma = .854$, p = .001) were positively related. Including a set of the two dummy variables about conversation with spouse improved this model significantly ($\chi^2(2) = 40.861$, p < .001). Elders having frequent conversations with their spouses showed higher life satisfaction than those ($\gamma = 1.317$, p = .001) who have lost a spouse (widows/widowers/the divorced) or those having infrequent conversations with their spouses (Figure 3).

There was also a significant interaction of gender with the number of children ($\gamma = -.813$, p = .017). In Figure 4, female elders with more children showed higher life satisfaction at baseline than those with fewer children. On the other hand, for male elders, there was no effect of the number of children.

Discussion

First, we found that life satisfaction decreased over the three year study period. Contrary to what might have been expected under the so-called well-being paradox, where subjective well-being remains relatively stable with age (Schilling, 2006), elders in our sample declined in life satisfaction over the three-year study period. The reason why the overall satisfaction of the elderly with their own lives was decreasing may be because their functional limitations and disease burdens were increasing with age (House, Lantz, & Herd, 2005). However, the average depressive tendency was stable in this sample, while there was significant variability in the rate of change with age among elders. Though there were two factors (subjective health status and the interaction of gender with number of children) related to the slopes of depressive tendency, we did not find either were factors that prevented any increase in depressive tendency. The effects of health status may be artifactual and attributable to ceiling effects in that measure. Since this scale had a small range, from 1 to 4, and most elders rated their health status as "good" ($M = 3.07$) at baseline, high scores at the initial survey are likely to decrease over three years, while lower scores have more room for upward movement. The interaction effect of gender and the number of children on depressive tendency is hard to understand. While female elders with more children showed lower depressive tendency levels at baseline, their depressive tendency increased over three years. Considering this result together with our finding that female elders with more children relative to those with fewer children reported higher life satisfaction steadily over three years, this seemingly contradictory finding in terms of depressive tendency may have resulted from some deficit of our data collection or analysis. For example, we can only estimate linear trajectories from our three-wave data set, and our significant dropout rate (43.0%) from Wave 1 (498) to Wave 3 (280), either of which may be influencing our results. Further, as Kendler (2005) and others point out, the quality of the relationship matters, and mere numerical count of children may not give us a full picture of the protective or depressogenic effects of the social relationship. However, at this point, we cannot conclusively interpret this finding. To estimate a more natural trajectory of depressive tendency, data sets with a greater number of waves are ultimately needed. As a result, although we can observe a declining trajectory of subjective well-being among elders over three years, none of the factors in this study appeared to prevent the deterioration of subjective well-being with increasing age. In addition to that, there were no gender differences of trajectories of subjective well-being. Further research is needed to detect those factors.

Second, in terms of relationships with spouses, elders having only infrequent conversations with their spouses showed higher levels of depressive tendency than either those having frequent spousal conversations or those without spouses (widows/widowers/the divorced). Additionally, elders having frequent conversations with their spouses showed higher levels of life satisfaction than either those having infrequent spousal conversations or those without spouses. Our hypothesis that marital activities such as conversations with spouses would be important for subjective well-being among elders is supported. Further, the quality of the marital relationship (as measured by spousal conversation) between husbands and wives appears to be more important than the mere existence of the marital relationship itself. However, there was no gender-difference of these effects, though it was hypothesized that there would be a more beneficial effect of spousal conversation for male elders, following the argument of some observers (e.g., Iwao, 2008). In this study, conversation with one's spouse seems to be equally important for both male and female elders in Japan. However, it is important to notice that more than half of the Japanese married elders in our sample (53.6%, 218 out of 407 persons) were not conversing with their spouses at a "satisfactory" level. It is not hard to surmise that to have a happy life in old age, both male and female elders would have a better chance of sustaining a good conversational relationship with their

spouse if they started in their early- and middle-aged adulthood years. In this study, half of these elders do well, but half do not.

Third, in terms of relationships with adult children, there was a beneficial effect of the number of children on subjective well-being among female elders only. Female elders with more children showed lower levels of depressive tendency and higher levels of life satisfaction, at least at baseline, than those with fewer children, while for male elders there was no such effect of the number of children. In previous research in rural China, the number of children had beneficial effects on subjective well-being among elders in traditionally organized communities (Silverstein et al., 2006). While Japan is one of the developed countries of the world, it is also an East Asian country and Confucian social norms remain an important part of contemporary society. In this light, family relationships might be considered to be important, and older parents might be said to have stronger connections with their adult children in Japan than those in the United States, where positive effects of adult children were not found (Sugisawa et al., 2002). Further, Japanese female elders seem to have a stronger commitment to their own family than Japanese male elders, possibly because they have built strong bonds with their children as a consequence of normative patterns associated with traditional gender roles. As a result, the number of children seems to have stronger effects on subjective well-being of female rather than male elders. There were no effects of co-residence or more frequent interaction with the closest children, although the area where this survey was conducted is a suburban area in Tokyo, and with a well-organized public transportation system it is relatively convenient for elders to reside and lead their own lives independently. Therefore, there may be a reduced need to either live with adult children or to see them often when they are relatively healthy. The number of children may represent a measure of the potential source of social support in time of need when elders fall sick or are involved in other challenging situations. If elders have more potential sources of support, this might provide them with a greater sense of relief and well-being. In sum, given the representativeness of our sample, elders living in suburban Tokyo seem to be capable of managing their daily lives by themselves apart from their adult children and without seeing them frequently. However, since elderly parents may count on their children as potential sources of support in time of need, the number of children has an independent beneficial effect on subjective well-being among elderly mothers.

The fourth and fifth hypotheses were partially supported. Elders with more interactions with friends showed lower levels of depressive tendency and higher levels of life satisfaction. Elders with more unpaid social activities showed lower levels of depressive tendency and higher levels of life satisfaction, while their professional pursuits or a working job status did not confer any effects. Such social activities as friendship and unpaid social participation, which are entered into voluntarily, are based on personal interests, and involve few obligations, had beneficial effects on the mental health of elders. But there were no gender-differences of effects of these activities on well-being although we expected female elders would enjoy greater beneficial effects of friendship or voluntary activities, while male elders would enjoy greater beneficial effects of paid work. Although female elders had more frequent contact with friends than males, the effects of friendship is similar for both male and female elders. Although male elders are more likely to have paid jobs, the effect of it was not significant.

Iwao (2008) described how wives were likely to enjoy interactions with various sources of support such as their children, friends, and voluntary social activities with those other than their husbands, while male elders were likely to over-rely on their wives and thereby potentially foster their resentment. Iwao's story seems to be somewhat overstated; her dystopic view may not reflect the typical relationship between Japanese husbands and wives, but an extreme "worst case" scenario. In fact, female elders are likely to have a more diverse

network consisting of their own children or friends than male elders. Female elders with more children are likely to have higher levels of subjective well-being, while males do not. However, for both male and female elders, the spousal relationship seems to be the most important source of social interaction, and friendship and voluntary social activities are similarly beneficial. Although there is much loose talk about lonely elderly husbands in Japanese mass media, our findings about old age in Japan suggest that husbands need wives, and wives need husbands equally. To enjoy a happy life in old age, our study suggests that both male and female elders should build and maintain strong relationships with their spouses and wide networks of children, friends, and other potentially protective sources of social interaction.

Limitations

Our study has some limitations. Based on three-waves of data, we can only estimate linear trajectories, which are at best imperfect models of change in such complex human functions as psychological well-being. This might be the reason why the change in depressive tendency found among female elders with more children appeared to be unnatural, or that there was non-significant variability in individual changes of life satisfaction. In addition, while we can estimate the rate of change in subjective well-being, we cannot determine the factors that prevent the deterioration of subjective well-being among elders. However, by collecting and using more than three waves of data we may be able to estimate more realistic trajectories and therefore find even better answers for the questions addressed in this study (Singer & Willett, 2003). It might be pointed out that activities of daily living or other functional status measures might have been controlled for, which may have even greater impact on the relationship between social interaction and change of well-being than subjective health status has. In addition, although we did not examine interactions of marital status with other social interactions, such as adult children, we found interesting findings as previous studies suggested (Zunzunegui et al., 2001; Sugisawa et al 2002). And, although this study focused on the linear growth curve of subjective well-being and time-invariate effects of social interactions, other models to estimate time-variate effects of social interactions are also possible. These limitations should be addressed in the future.

Conclusion

Based on a three-wave panel survey over three years, we clarified gender differences of social interactions and their effects on changes in subjective well-being among Japanese elders. Although the importance of the number of children was demonstrated as a potential source of support only for female elders, there were no other gender differences of effects of social interactions. Spousal conversation and voluntary social activities such as friendship interactions and unpaid social participation seem to be important for both male and female elders. The uniqueness of social relations among Japanese elders due to traditional gender norms, compared to Western societies such as the U.S., may not be as great as it once might have been. There are few studies on temporal changes in subjective well-being among Japanese elders, therefore, our study provides one of the few empirical views of this phenomenon. In future studies, it would also be desirable to examine how to prevent or ameliorate deterioration of subjective well-being among elders. Nevertheless, the findings of this work so far suggest that even in a highly industrialized developed country, maintaining voluntary social ties in the community and high levels of communication with one's spouse are manifestly associated with good mental health outcomes.

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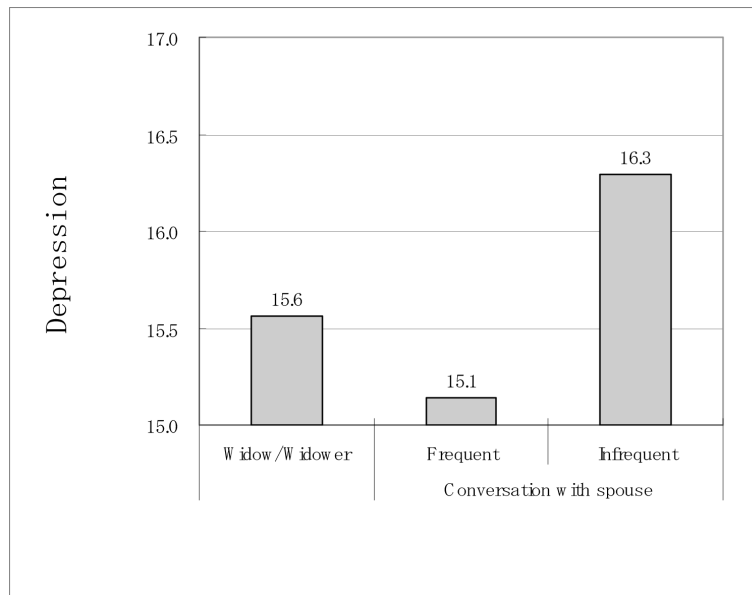
Figure 1.
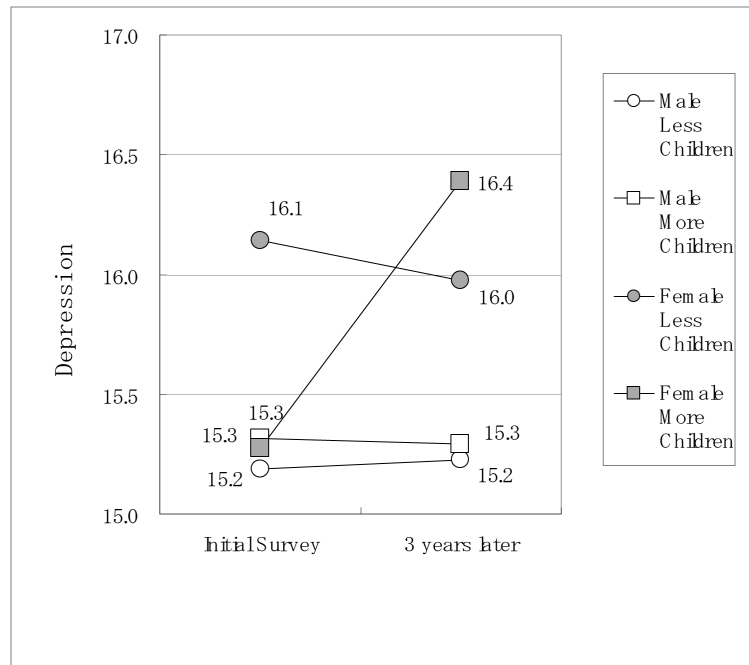Levels of depressive tendency by conversation with spouse

Figure 2.
Change of depressive tendency over three years: Interaction of gender x the number of children.
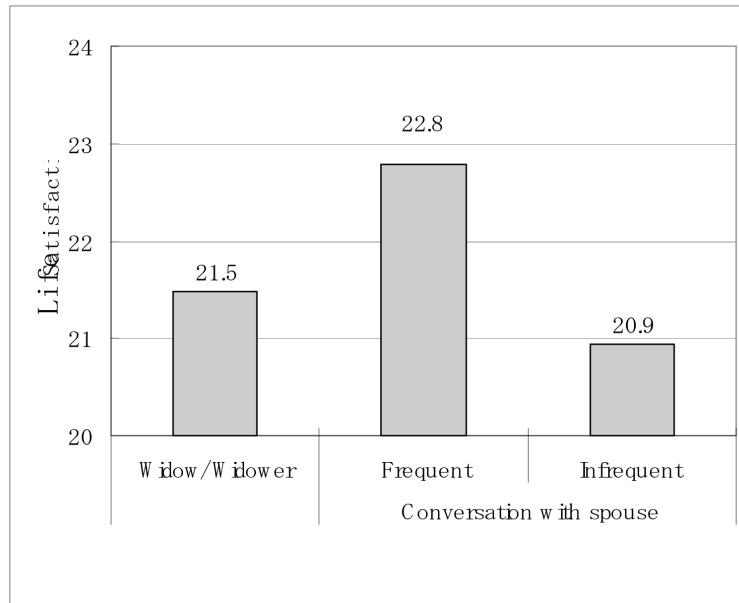
Figure 3.
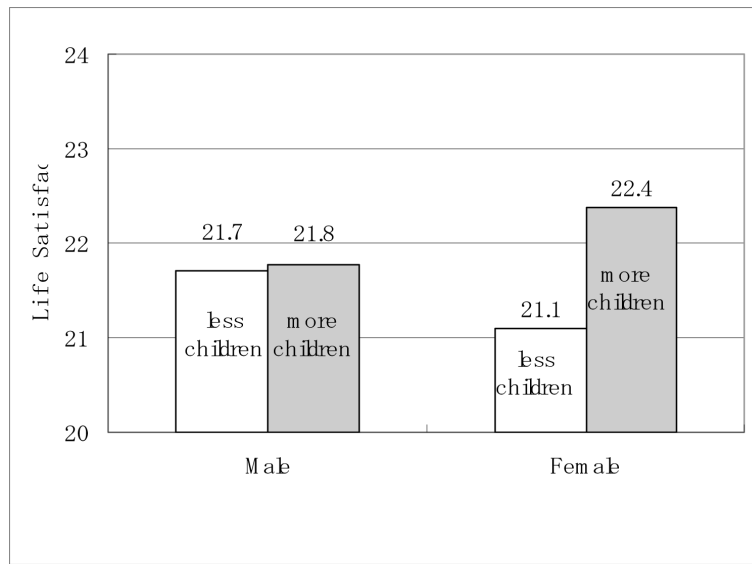Levels of life satisfaction by conversation with spouse

Figure 4.
Levels of life satisfaction and gender and number of children

Table 1

Mean differences of variables at the initial survey by gender (n=498)

		Male (n=275)		Female (n=223)		
	Range	M	SD	M	SD	t (496)
Age	64-80	70.22	3.85	70.34	4.10	−.333
Health status [a)]	1-4	3.14	.82	3.00	.73	1.963
Economic status [b)]	1-4	2.71	.76	2.81	.72	−1.519
Social participation [c)]	1-3	1.54	.65	1.61	.69	−1.258
Number of children	1-6	2.13	.76	2.08	.74	.794
Interaction with friends [d)]	0-5	1.87	1.66	3.04	1.58	−8.042[***]
Life satisfaction	10-30	21.91	3.77	22.20	3.81	−.849
Depressive tendency	11-33	15.38	3.42	15.81	3.64	−1.370

[*] $p<.05$

[**] $p<.01$

[***] $p<.001$

[a)] Note: Subjective health status was measured on a four-point scale, with "1" indicating "poor" health, and "4" indicating "good" health.

[b)] Note: Economic status was measured on a four point scale, with "1" indicating "marginal" and "4" indicating "affluent."

[c)] Note: Social participation was measured on a three point scale, with "1" indicating "almost never," and "3"indicating "often."

[d)] Note: Interaction with friends was measured on a six-point scale, with "0" indicating "never," and "5" indicating "more than twice a week."

Table 2

Proportional differences by gender (%) (n=498)

	Male (n=275)	Female (n=223)	χ^2	df
Spouse	93.1	67.7	51.303***	1
Employed	35.3	8.1	47.232***	1
Relationship with the most intimate child				
Infrequent contact with the child living apart	24.7	15.2	8.127*	2
Frequent contact with the child living apart	47.3	48.4		
Living with the child	28.0	36.3		
Relationship with spouse				
Frequent conversation with spouse	44.4	30.0	53.495***	2
Infrequent conversation with spouse	48.7	37.7		
Widows/Widowers	6.9	32.3		

*
$p<.05$

**
$p<.01$

***
$p<.001$

Table 3

Estimation of level-2 predictors of depressive tendency

	Estimate	SE	t	(df)	P
Level of depressive tendency at an initial point					
Intercept	15.709	.301	52.12	(488)	.000
Gender (male = 1, female = 0)	−0.456	.292	−1.56	(488)	.118
Health status	−1.923	.179	−10.75	(488)	.000
Economic status	−0.345	.164	−2.10	(488)	.036
Social Participation	−0.371	.185	−2.01	(488)	.045
Interaction with friends	−0.231	.076	−3.06	(488)	.003
The number of children	−0.578	.271	−2.13	(488)	.033
Infrequent conversations with spouse (infrequent conversations with spouse = 1, widows/widowers/divorced = 0)	0.730	.339	2.16	(488)	.031
Frequent conversations with spouse (frequent conversations with spouse = 1, widows/widowers/divorced = 0)	−0.418	.351	−1.19	(488)	.235
Gender × the number of children	0.664	.359	1.85	(488)	.064
Change rate of depressive tendency for one year					
Intercept	0.158	.077	2.05	(493)	.041
Gender (male = 1, female = 0)	−0.155	.104	−1.49	(493)	.137
Health	0.224	.071	3.17	(493)	.002
The number of children	0.284	.101	2.81	(493)	.006
Gender × the number of children	−0.298	.135	−2.20	(493)	.028

Table 4

Estimation of level-2 predictors of life satisfaction

	Estimate	SE	t	(df)	p
Level of life satisfaction at an initial point					
Intercept	21.739	.318	68.39	(488)	.000
Gender (male = 1, female = 0)	−.001	.285	−0.01	(488)	.996
Health status	1.094	.175	6.26	(488)	.000
Economic status	1.261	.180	7.02	(488)	.000
Social participation	.695	.204	3.41	(488)	.001
Interaction with friends	.204	.083	2.46	(488)	.014
The number of children	.854	.256	3.34	(488)	.001
Infrequent conversations with spouse (infrequent conversations with spouse = 1, widows/widowers/divorced = 0)	−.538	.373	−1.44	(488)	.150
Frequent conversations with spouse (frequent conversations with spouse = 1, widows/widowers/divorced=0)	1.317	.388	3.40	(488)	.001
Gender × the number of children	−.813	.339	−2.40	(488)	.017
Change rate of life satisfaction for one year					
Intercept	−.184	.055	−3.31	(497)	.001