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A Cultural Perspective on Functional Limitations and Well-Being

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Abstract

Functional limitations—difficulty in carrying out activities of daily living—have been linked to poorer well-being in Western cultures. This might be partly due to the lower personal control associated with functional limitations. However, compared with the West, in Asian cultural contexts (e.g., Japan) where agency and control are based less predominantly on individual attributes, the link between functional limitations and well-being may be weaker. Using cross-sectional probability samples from the United States and Japan (Study 1), functional limitations were associated with lower well-being in both cultures, though the association was weaker in Japan than in the United States and personal control played a mediating role. Furthermore, analyses of longitudinal data (Study 2) showed the cross-cultural patterns generally consistent with the cross-sectional analyses of Study 1, though the cultural moderation was found for fewer well-being measures. Such findings enrich our understanding of how health status and well-being are related across cultures.

Keywords

functional limitations, well-being, personal control, culture

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Functional limitations (FLs) are defined as difficulties in carrying out the activities of daily living (ADLs), or daily activities people do to live independently and be integrated within the environment (World Health Organization, 2011). Problems with physical health typically start to appear in middle age (Verbrugge, 1986). FLs have repeatedly been linked to poorer well-being in Western cultures across adulthood and old age (e.g., Steptoe et al., 2015; Taylor & Lynch, 2004), possibly due to the loss of personal control associated with FLs (Drewelies et al., 2017; Infurna et al., 2018; Infurna & Okun, 2015).

However, ties between FLs and well-being may depend on sociocultural contexts that provide certain meanings to agency and control (Markus et al., 2006; Ryff et al., 2014; Weisz et al., 1984). Compared with Western cultural contexts, in Asian cultural contexts, one's agency is based less predominantly on individual attributes (Iyengar & Lepper, 2000; Markus et al., 2006; Miller, 2003). Due to such cultural differences in the bases of agency and control, the link between FLs and poor well-being may be weaker in Asian cultural contexts, such as Japan, than in Western cultural contexts, such as the United States.

The present study thus examined whether the associations between FLs and well-being are weaker in Japan than in the United States. In addition, we explored whether cultural moderation of the link between FLs and well-being might be partly explained by the mediating role of personal control.

FLs, Personal Control, and Well-Being

Numerous studies observed the relationship between functional health and well-being (Kunzmann et al., 2000; Lin & Wu, 2014; Okun et al., 1984; Steptoe et al., 2015; Taylor & Lynch, 2004). A meta-analysis (Okun et al., 1984) found the average effect size of the link between FLs and poorer subjective well-being to be of medium size (r = .35), also finding the link to be substantial throughout adulthood, even though the link tends to get stronger with increasing age. Furthermore, longitudinal studies have shown the links between functional health and well-being across time. An increase in physical disability was linked to greater depressive symptoms across time (Taylor & Lynch, 2004). In another longitudinal study, poor functional health measured

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at an earlier time point was associated with a decrease in positive affect over time, while the reverse association was not significant (Kunzmann et al., 2000), thus indicating the temporal relationships between poor functional health and well-being. These studies suggest that FLs are associated with, and prospectively predict, worse well-being in Western cultural contexts.

Several studies have also found that greater FLs are linked to decreased personal control, which is known to be important for the continued well-being across adulthood (Drewelies et al., 2017; Infurna et al., 2018; Infurna & Okun, 2015). Personal control, the belief that people are in control of desired outcomes (Lachman & Weaver, 1998), is known to work as a psychological protective factor in Western cultural context (Heckhausen & Schulz, 1995). Studies have shown that those who perceive they have more control over outcomes report better mental and physical health, as well as better well-being (Infurna & Mayer, 2015; Lachman & Agrigoroaei, 2010; Lachman et al., 2011; Rizza et al., 2017). These findings as a whole suggest that the loss of perceived control associated with FLs may play a mediating role in the link between FLs and lower well-being.

Cultural Influences: Effects and Bases of Personal Control

While the extant studies imply the mediating role of personal control in the relationship between FLs and well-being, such pathways may be uniquely relevant in Western cultural contexts. Cultural meaning systems prescribe beliefs and ideas about what is "good," "true," and "right" (Fiske et al., 1998; Shweder, 2003). One of the characteristics of Western cultural meaning systems is the belief that a person is an independent entity defined by internal attributes, whereas one characteristic of Asian cultural meaning systems is the belief that a person is an interdependent entity fundamentally embedded in social contexts and relationships (Markus & Kitayama, 1991; Triandis, 1989). Such cultural systems shape meanings of personal control, thereby possibly influencing links between FLs, control, and well-being. Specifically, cultural contexts can shape the extent to which FLs serve as a basis of personal control.

Infurna and Infurna (2017) suggest that perceived control is not a fixed trait but a belief that develops and is shaped through contexts and experiences. Theoretical and conceptual models of control have recognized the role of inter- and intrapersonal experiences on the development of perceived control (e.g., Bandura, 1997). Building on these conceptual models, empirical studies examining the antecedents of personal control in Western cultures have generally found personal factors, such as FLs and self-rated health, to be important sources of personal control across adulthood (Drewelies et al., 2017; Infurna et al., 2018; Wurm et al., 2007; though see Infurna & Mayer, 2015 for an exception). However, such personal factors, including one's own physical functioning, may matter more for one's agency and control in Western cultural contexts where people are considered to be independent and driven by intrapersonal attributes (Fiske et al., 1998; Markus & Kitayama, 1991; Miller, 1984).

On the contrary, in Asian cultural contexts where people are perceived to be interdependent and fundamentally embedded in social contexts (Fiske et al., 1998; Markus & Kitayama, 1991; Miller, 1984), decline in functional health may play less of a major role in shaping one's agency or control. Although there is no direct evidence on cultural differences in the bases of personal control, cross-cultural studies have suggested that one's sense of agency is based more on intrapersonal attributes and behaviors in Western cultures than in Asian cultures. For example, American mass media tends to explain athletes' performance predominantly through personal characteristics of the athletes, whereas Japanese counterparts are more likely to refer to athletes' backgrounds and social experiences (Markus et al., 2006). Reflecting such cultural differences in ideas about the agency, personal attributes and behaviors tend to matter more for Westerners' than for Easterners' psychological processes indicative of agency, such as intrinsic motivation (Iyengar & Lepper, 2000), dissonance reduction (Hoshino-Browne et al., 2005; Kitayama, Snibbe, Markus, and Suzuki, 2004), emotional reactivity (Chentsova-Dutton & Tsai, 2010), and environmental support (Eom, Kim, Sherman, and Ishii, 2016). For example, focusing on individual aspects of the self led to more intense emotional reactivity for European Americans than for Asian Americans (Chentsova-Dutton & Tsai, 2010). Based on these findings, it can be predicted that one's personal characteristics, such as own physical functioning, may be more likely to shape one's sense of agency and control in the United States than in Japan.

Research on the association between functional health and well-being is rare in non-Western cultural contexts. One study in China found physical frailty, which was based on general physical health as well as FLs, was negatively associated with life satisfaction in Chinese older adults (Yang et al., 2016). In addition, a longitudinal study conducted in Taiwan found that functional disability contributed to subsequent depressive symptoms (Chao, 2014). However, no studies have directly compared the strength of the association across cultures, making it unclear whether cultural context moderates the link between FL and well-being.

The present study thus examined the association between FLs and well-being cross-culturally, predicting that the association would be stronger in Western (United States) compared with Asian (Japan) cultural contexts *due to the mediating role of a personal control*. Specifically, we predicted that the association between FLs and well-being would be stronger in the United States compared with Japan because FLs are more relevant for one's personal control in the United States than in Japan. We tested a moderated mediation model depicted in Figure 1. In this model, we predicted that personal control mediates the association between FLs

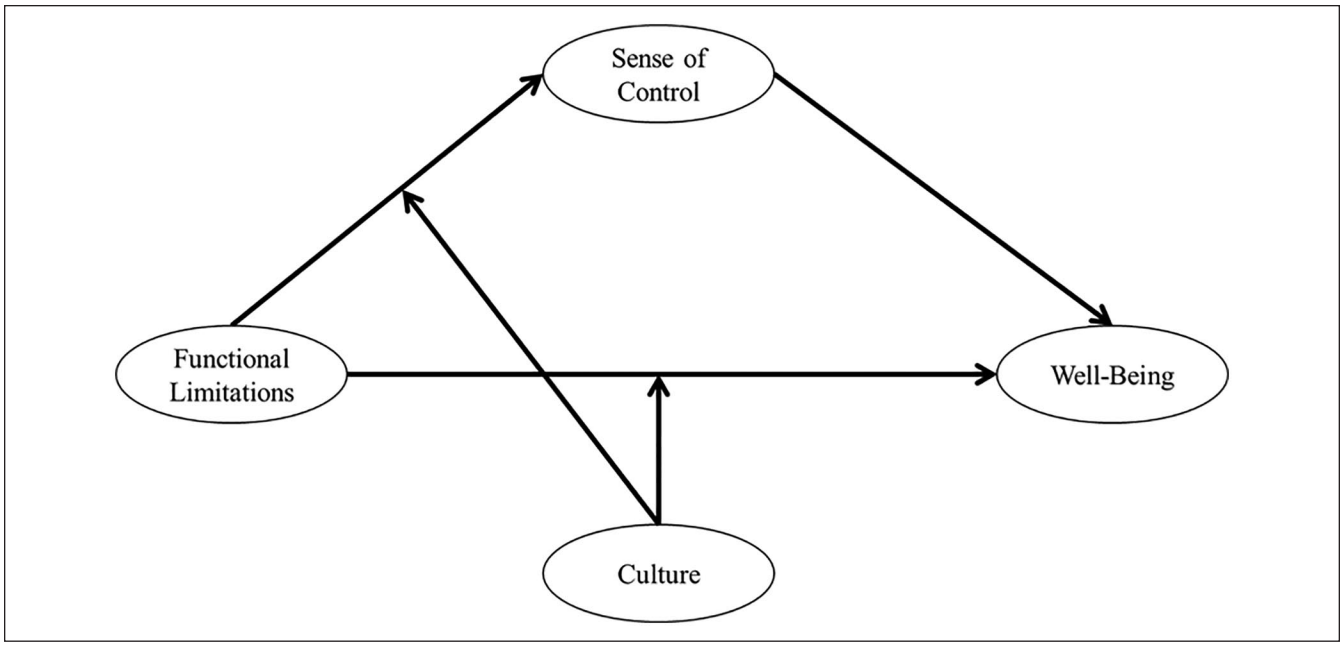

Figure 1. Illustration of the models showing the influence of functional limitations to well-being through personal control. We predicted that culture would moderate the path from functional limitations to personal control.

and well-being in the United States, but such a mediation effect (i.e., indirect effect of personal control) would be weaker in Japan. We tested these predictions in two studies. Study 1 was a cross-sectional analysis examining the association between FLs and well-being, whereas Study 2 was an extension of Study 1 examining the predicted relationship using longitudinal data.

Study 1

The aim of Study 1 was to (a) compare the strength of the relationship between FLs and well-being in the United States and Japan and (b) to test the mediating role of personal control. As outcomes, we used multiple well-validated measures of well-being (Ryan & Deci, 2001; Ryff, 1989) that capture hedonic well-being (i.e., subjective judgment of happiness, feeling good) and eudaimonic well-being (i.e., meaning, purpose, and fulfillment). We hypothesized that the association between FLs and well-being measures will be stronger in the U.S. sample than that of Japan. We also predicted that personal control will mediate the relationship between FLs and well-being, in which the indirect effect of personal control would be stronger in the U.S. sample than that of Japan.

Method

Participants and procedure. We used a subset of the Midlife in the United States (MIDUS) survey and the corresponding Midlife in Japan (MIDJA) survey conducted in 2008. For the U.S. sample, we used the MIDUS Project 1 of the second wave of the MIDUS (i.e., MIDUS II, 2002–2009). MIDUS II is the longitudinal follow-up data from the MIDUS I (1995–1996). We used adults from the random-digit-dialing sample (Radler & Ryff, 2010). This sample included noninstitutionalized, English-speaking adults randomly selected from working telephone banks in the 48 contiguous states. For the Japanese sample, the MIDJA survey data (2008–2009), a probability sample of Japanese adults from the Tokyo metropolitan area was used.

Participants with the predictor variable and at least one outcome variable were included in the final analysis sample. As a result, the U.S. sample consisted of 1,779 adults (971 females; M_{age} = 56.68 years, age range = 30–84 years). The final Japanese sample consisted of 1,006 adults (510 females; M_{age} = 54.18 years, age range = 30–79 years).

Measures

FLs. FLs were measured by using the measure of ADLs (Japan: α = .93, United States: α = .95). Participants were given a list of ADLs and asked to report whether they experienced any difficulties performing each of the activities. ADL scores were determined from 10 items: Bathing or dressing yourself; climbing one flight of stairs; walking one block; lifting or carrying groceries; climbing several flights of stairs; bending, kneeling, or stooping; walking more than a mile; walking several blocks; vigorous activities (e.g., running, lifting heavy objects); and moderate activities (e.g., bowling, vacuuming). Response options ranged from 1 = *not at all* to 4 = *a lot*. Individual participants' FL scores were computed as the mean of all the items, with higher scores

indicating greater impairment (ranging from 1 to 4). The score was treated as a continuous variable in the analyses.

Personal control. Personal control was measured based on a composite measure using the personal mastery measure (Lachman & Weaver, 1998) and domain-specific control questions following the previous study (Kitayama et al., 2010). The personal mastery scale included four items (e.g., "I can do just about anything I really set my mind to do" and "What happens to me in the future mostly depends on me"). Domain-specific control questions asked the amount of control perceived for each of six domains such as work, finance, and family. Participants were asked to indicate how they agreed with each statement using a 7-point scale. Higher scores indicate greater levels of personal control. Personal control was computed by averaging the standardized value of the four personal mastery and six domain-specific control questions (United States: $\alpha = .73$; Japan: $\alpha = .68$).

Well-being. We indexed eight scales covering distinct forms of both hedonic well-being (i.e., life satisfaction, negative affect, positive affect) and eudaimonic well-being (i.e., the six psychological well-being subscales). We tested measurement invariance for each subscale and measure across the two samples to see whether the measures were compatible across the two culture groups (for details, see Supplemental Material A). Results show that the measures are compatible across the two samples excluding the purpose in life subscale. For purpose in life, the invariance was met by excluding one item.[1]

Life satisfaction. Life satisfaction, defined as judgments about life in general or specific life domains (Pavot & Diener, 2008), was assessed with a validated six-item scale (Prenda & Lachman, 2001). The scale asked the individuals about life overall, work, health, relationship with spouse/partner, relationship with children, and finance. Each question asked, "On a scale of 0 to 10 where 0 means the worst and 10 means the best how would you rate your . . . these days?" ($\alpha_{US} = .70$, $\alpha_{Japan} = .75$).

Positive and negative affect. Positive and negative affect was measured by using the Positive and Negative Affect Scale (Mroczek & Kolarz, 1998) and Positive and Negative Affect Schedule (PANAS; Watson et al., 1988), which also has been validated in Japan (Sato & Yasuda, 2001). Respondents rated the frequency (1 = *none of the time*, 5 = *all of the time*) of experiencing each of the following states during the past 30 days: 10 positive affect adjectives (e.g., enthusiastic, interested, determined) and 11 negative affect adjectives (e.g., afraid, upset, distressed). The mean across each set of items is used for the analysis. Higher scores reflect higher levels of positive/negative affect (United States: $\alpha_{positive} = .93$, $\alpha_{negative} = .91$; Japan: $\alpha_{positive} = .92$, $\alpha_{negative} = .90$).

Psychological well-being. We used six scales of Psychological Well-being (Ryff, 1989): autonomy (e.g., "My decisions are not usually influenced by what everyone else is doing"; Japan: $\alpha = .70$, United States: $\alpha = .71$), environmental mastery (e.g., "In general, I feel I am in charge of the situation in which I live"; Japan: $\alpha = .73$, United States: $\alpha = .78$), personal growth (e.g., "For me, life has been a continuous process of learning, changing, and growth"; Japan: $\alpha = .74$, United States: $\alpha = .75$), positive relations with others (e.g., "I know that I can trust my friends, and they know they can trust me"; Japan: $\alpha = .76$, United States: $\alpha = .78$), purpose in life (e.g., "Some people wander aimlessly through life, but I am not one of them"; Japan: $\alpha = .68$, United States: $\alpha = .71$), and self-acceptance (e.g., "When I look at the story of my life, I am pleased with how things have turned out"; Japan: $\alpha = .78$, United States: $\alpha = .84$). Each scale consisted of seven items, with a mix of positive and negative items. On a scale of 1 to 6, respondents indicated whether they agreed or disagreed strongly, moderately, or slightly that an item described how they thought and felt. Negative items were reverse coded so that higher scores on each scale reflect the presence of more positive appraisals. Each subscale scores were created from all multiple-item scales.

Covariates. Our analyses controlled for demographic variables that could confound the relationship of interest. Such variables were age, gender, and years of education, which have been linked to psychological well-being (Ryff et al., 1999). Educational attainment was assessed on a 7-point scale (1 = *eighth grade, junior high school*; 7 = *attended or graduate from graduate school*). With the educational system different across cultures, educational attainment was originally assessed on a culture-specific scale ranging from 1 (*eighth grade, junior high school*) to 12 (*PhD, or other professional degree*) in the United States, and from 1 (*eighth grade, junior high school graduate*) to 8 (*graduate school*) in Japan. To make the scales comparable across groups, we rescaled the scores to a 7-point scale for both cultures (1 = *eighth grade, junior high school*; 7 = *attended or graduate from graduate school*; Park et al., 2013).

Results

Descriptive analysis. Descriptive statistics for the key variables are presented in Table 1. The U.S. sample was older and more educated than the Japanese sample, $t(1{,}813.75) = 2.87$, $p < .001$; $t(3{,}268) = 4.79$, $p < .001$, respectively. U.S. respondents reported greater FLs (i.e., higher ADL scores) than the Japanese respondents, $t(2{,}295.02) = 9.53$, $p < .001$.[2]

Cultural Moderation of the Link Between FLs and Well-Being

We first predicted that the association between FLs and well-being would be stronger in the United States than Japan. To

Table 1. Descriptive Statistics of the Key Variables and Cultural Differences in Study 1.

	United States			Japan		
Variable	*N*	*M* (or %)	*SD*	*N*	*M* (or %)	*SD*
Age	1,779	56.68	12.55	1,006	54.18	14.09
Gender (% female)	1,779	54.6		1,006	50.7	
Education	1,777	4.58	1.67	996	4.25	1.69
Functional limitations	1,779	1.68	0.81	1,006	1.40	0.72
Personal control	1,572	0.23	0.53	736	–.38	0.51
Autonomy	1,773	37.36	7.02	1,005	30.63	5.32
Environmental mastery	1,773	37.84	7.45	1,005	31.69	5.41
Personal growth	1,773	38.21	7.03	1,005	33.81	5.65
Positive relations with others	1,773	40.12	7.05	1,005	33.54	5.734
Purpose in life	1,773	32.52	6.40	1,004	27.00	5.09
Self-acceptance	1,773	37.88	8.30	1,005	30.84	5.70
Life satisfaction	1,779	7.45	1.30	1,006	6.10	1.58
Positive affect	1,760	3.47	0.69	995	3.17	0.69
Negative affect	1,741	1.54	0.54	997	1.79	0.61

test this hypothesis, we ran a series of hierarchical multiple regression analyses using each well-being measure as the outcome. FLs was entered in Model 1 and culture in Model 2, followed by Culture × FL interaction in Model 3. Finally, demographic covariates were added in Model 4 to examine the extent to which our findings are reliant on the presence of covariates (Simmons, Nelson, and Simonsohn, 2011). Separate regressions were conducted to predict the nine well-being outcomes at a corrected alpha of 0.05/9 = 0.006 to decrease the risk of a Type I error with multiple statistical tests.

FL was a significant predictor of all well-being measures across all the models: autonomy: $\beta = -.06$, $t(2,758) = -2.96$, $p = .003$; environmental mastery: $\beta = -.20$, $t(2,758) = -9.75$, $p < .001$; personal growth: $\beta = -.18$, $t(2,758) = -7.10$, $p < .001$; positive relations with others: $\beta = -.12$, $t(2,758) = -6.14$, $p < .001$; purpose in life: $\beta = -.16$, $t(2,757) = -7.63$, $p < .001$; self-acceptance: $\beta = -.18$, $t(2,758) = -8.86$, $p < .001$; life satisfaction: $\beta = -.22$, $t(2,770) = -11.36$, $p < .001$; positive affect: $\beta = -.22$, $t(2,740) = -9.97$, $p < .001$; negative affect: $\beta = .25$, $t(2,723) = 11.51$, $p < .001$, suggesting that FLs are generally associated with lower well-being in the overall sample.

In addition, culture was a significant predictor for all well-being measures across models: autonomy, $\beta = -.92$, $t(2,760) = -25.61$, $p < .001$; environmental mastery, $\beta = -.82$, $t(2,760) = -23.02$, $p < .001$; personal growth, $\beta = -.64$, $t(2,760) = -11.31$, $p < .001$; positive relations, $\beta = -.89$, $t(2,760) = -24.49$, $p < .001$; purpose in life, $b = -.85$, $t(2,759) = -23.36$, $p < .001$; self-acceptance, $\beta = -.85$, $t(2,760) = -23.71$, $p < .001$; life satisfaction, $\beta = -.86$, $t(2,767) = -24.65$, $p < .001$; positive affect, $\beta = -.19$, $t(2,737) = -9.97$, $p < .001$; and negative affect, $\beta = .25$, $t(2,720) = 11.55$, $p < .001$, indicating that Americans reported higher well-being than Japanese (see Supplemental Material B for detailed statistics).[3]

Most importantly, supporting our first hypothesis, the Culture × FL interaction was found for most of the well-being measures (Figure 2). Specifically, the interaction was significant for environmental mastery, $\beta = .20$, SE_$\beta = .05$, $t(2,760) = 4.29$, $p < .001$, 95% confidence interval (CI) = [.11, .29], $R^2 = .007$; personal growth, $\beta = .19$, SE_$\beta = .05$, $t(2,760) = 3.80$, $p < .001$, 95% CI = [.09, .28], $R^2 = .004$; purpose in life, $\beta = .22$, SE_$\beta = .05$, $t(2,759) = 4.55$, $p < .001$, 95% CI = [.12, 31], $R^2 = .006$; self-acceptance, $\beta = .14$, SE_$\beta = .05$, $t(2,760) = 2.98$, $p = .003$, 95% CI = [.05, .23], $R^2 = .003$; life satisfaction, $\beta = .21$, SE_$\beta = .05$, $t(2,767) = 4.60$, $p < .001$, 95% CI = [.12, .30], $R^2 = .007$; positive affect, $\beta = .28$, SE_$\beta = .05$, $t(2,737) = 5.42$, $p < .001$, 95% CI = [.18, .38], $R^2 = .012$; and negative affect, $\beta = -.21$, SE_$\beta = .05$, $t(2,720) = -4.21$, $p < .001$, 95% CI = [−.31, −.11], $R^2 = .010$, but not for autonomy, $\beta = .06$, SE_$\beta = .05$, $t(2,737) = 1.23$, n.s., 95% CI = [−.04, .15], and positive relations, $\beta = .02$, SE_$\beta = .05$, $t(2,765) = .50$, n.s., 95% CI = [−.07, .12]. Analyses of the simple slopes showed that associations were stronger for the U.S. sample than the Japanese sample: environmental mastery: $\beta_{US} = -.28$, $t_{US}(2,765) = -12.90$, $p_{US} < .001$, $\beta_{Japan} = -.12$, $t_{Japan}(2,765) = -3.61$, $p_{Japan} < .001$; personal growth: $\beta_{US} = -.25$, $t_{US}(2,765) = -11.50$, $p_{US} < .001$, $\beta_{Japan} = -.11$, $t_{Japan}(2,765) = -3.25$, $p_{Japan} = .001$; purpose in life: $\beta_{US} = -.24$, $t_{US}(2,765) = -11.13$, $p_{US} < .001$, $\beta_{Japan} = -.07$, $t_{Japan}(2,764) = -2.14$, $p_{Japan} = .033$ (n.s.); self-acceptance: $\beta_{US} = -.23$, $t_{US}(2,765) = -10.93$, $p_{US} < .001$, $\beta_{Japan} = -.12$, $t_{Japan}(2,765) = -3.81$, $p_{Japan} < .001$; life satisfaction: $\beta_{US} = -.30$, $t_{US}(2,772) = -14.70$, $p_{US} < .001$, $\beta_{Japan} = -.14$, $t_{Japan}(2,772) = -4.43$, $p_{Japan} < .001$; positive affect: $\beta_{US} = -.32$, $t_{US}(2,742) = -14.10$, $p_{US} < .001$, $\beta_{Japan} = -.11$, $t_{Japan}(2,742) = -3.10$, $p = .002$; negative affect: $\beta_{US} = .33$, $t_{US}(2,725) = 14.34$, $p_{US} < .001$, $\beta_{Japan} = .16$, $t_{Japan}(2,725) = 4.77$, $p_{Japan} < .001$.[4]

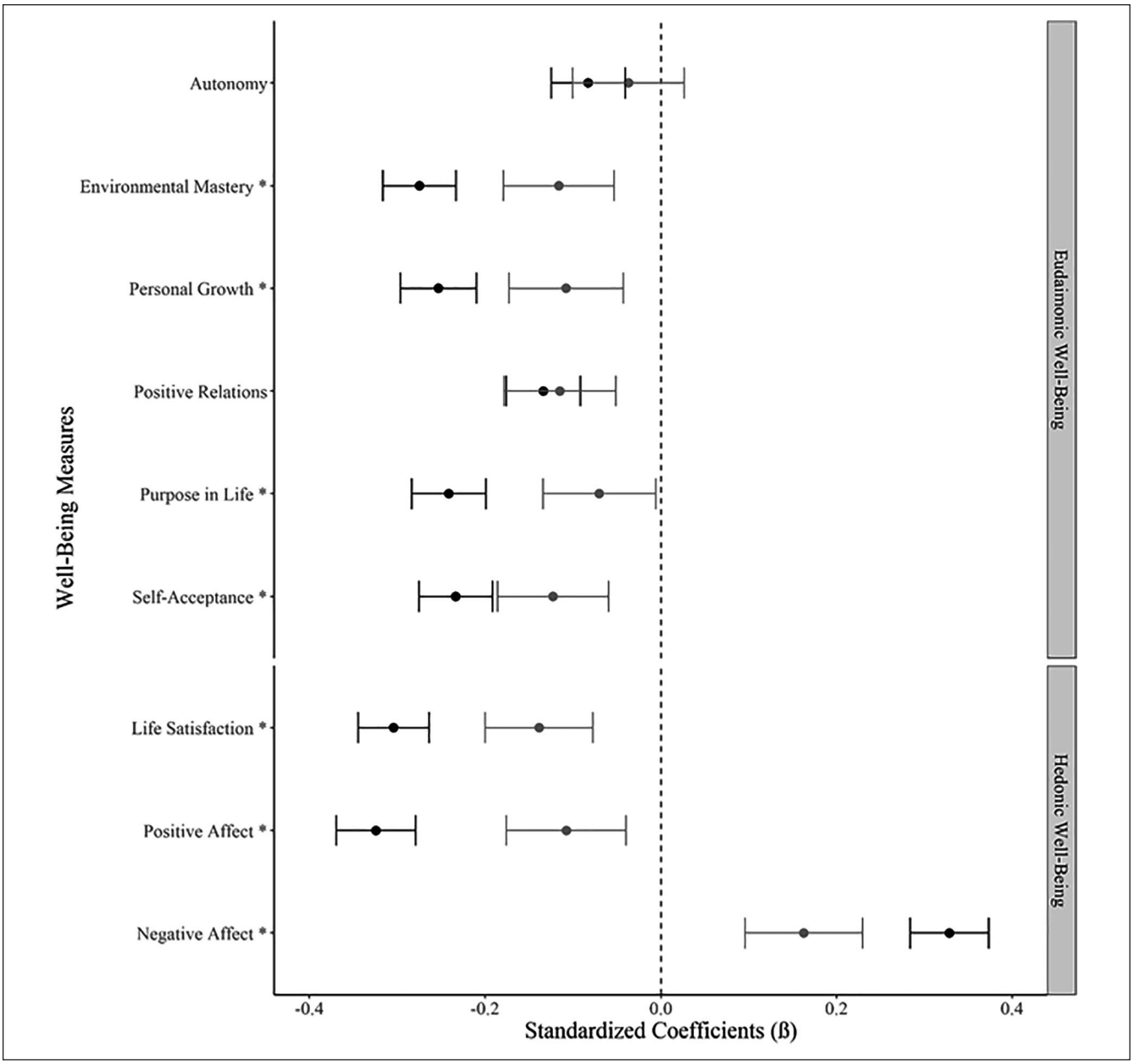

Figure 2. Cultural differences in association between functional limitations and well-being measures in Study 1.
Note. Dark line = United States; gray line = Japan; control variables: gender, age, and education; well-being measures with an asterisk (*) indicate significant cultural moderation. Error bars represent standard errors.

Personal control as a mediator. For our second set of predictions, we tested a moderated mediation model for each well-being outcome with personal control as the mediator and culture as the moderator. We first ran a regression analysis testing whether culture moderates the link between FLs and personal control (mediator), which showed a significant Culture × FL interaction, $\beta = .27$, $t(2,290) = 4,99$, $p < .001$, 95% CI = [.16, .38]. The association between FLs and personal control was significant for the U.S. sample, $\beta = -.28$, $t(2,290) = -12.50$, $p < .001$, 95% CI = [−.33, −.24], but not for the Japanese sample, $\beta = -.07$, $t(2,290) = -1.81$, $p = .071$, 95% CI = [−.14, .01].

As a second step of the moderated mediation model, we ran another regression analysis testing the link between personal control and well-being measures, while also including the direct effect of the Culture × FL interaction on well-being measures. The results found personal control to be a significant predictor of all the well-being outcomes (autonomy: $\beta = .34$, 95% CI = [.30, .38], $p < .001$; environmental mastery: $\beta = .55$, 95% CI = [.51, .58], $p < .001$; personal

Table 2. Results of the Bootstrapping Analysis for the Moderated Mediation Model.

Model outcome	Moderated mediation index	*SE*	99.4% CI	
			Lower	Upper
Autonomy	0.655	0.148	0.267	1.095
Environmental mastery	1.096	0.236	0.452	1.745
Personal growth	0.905	0.198	0.371	1.438
Positive relations with others	0.899	0.197	0.357	1.429
Purpose in life	0.878	0.190	0.335	1.428
Self-acceptance	1.251	0.274	0.474	1.986
Life satisfaction	0.240	0.052	0.102	0.390
Positive affect	0.107	0.024	0.042	0.173
Negative affect	−0.053	0.012	−0.086	−0.022

Note. CI = confidence interval.

growth: β = .49, 95% CI = [.45, .52], $p < .001$; positive relations: β = .45, 95% CI = [.42, .49], $p < .001$; purpose in life: β = .45, 95% CI = [.42, .49], $p < .001$; self-acceptance: β = .56, 95% CI = [.53, .60], $p < .001$; life satisfaction: β = .57, 95% CI = [.54, .61], $p < .001$; positive affect: β = .56, 95% CI = [.53, .60], $p < .001$; negative affect: β = −.32, 95% CI = [−.36, −.28], $p < .001$).

Next, a bootstrapping procedure was used to compute a corrected CI of 99.4% around the indirect effect for each well-being outcome. Results supported the moderated mediation model for all well-being measures, suggesting the conditional indirect effect of personal control was larger in the United States than in Japan (Table 2). Specifically, indirect effect of personal control (i.e., where the path between FLs and personal control was allowed to vary across cultures, whereas the path between personal control and well-being was not) was significant for all well-being measures in the United States, but none were significant in Japan. This suggests that FLs were associated with personal control in the United States, which then predicted higher well-being; however, in Japan, FLs were not associated with personal control, and thus there was no indirect link through personal control.

Discussion

From two comparable probability samples, results provide initial evidence that while the association between FL and well-being measures is generally found across the two groups, the association is stronger in the United States compared with Japan. Furthermore, personal controlmediated cultural differences in the link between FLs and well-being. Specifically, FLs predicted lower personal control in the United States (but not in Japan), and lower personal control in turn predicted lower well-being across cultures, thus resulting in the indirect effect of personal control in the link between FL and well-being in the United States, but not in Japan. These results suggest that cultural moderation of the link between FLs and well-being can be partly explained by cultural differences in antecedents of personal control. To test whether the link between FLs and well-being found with cross-sectional data in Study 1 is present with longitudinal outcomes, we conducted a follow-up study.

Study 2

To test whether culture moderates the link between FLs and well-being measured across time (longitudinally), we tested the same set of hypotheses with additional waves of the MIDUS and MIDJA studies. This was done by examining the respective follow-up assessments in the United States and Japan (i.e., MIDUS 3 and MIDJA 2), while controlling for the well-being assessments at the prior point (i.e., MIDUS 2 and MIDJA 1, which are the data used in Study 1). We examined whether that the same set of predictions tested with cross-sectional data in Study 1 would hold with longitudinal data in Study 2, by using the well-being measures from the follow-up assessments, while controlling for the respective well-being measures in the earlier survey. So doing shifts the core analytic questions to a focus on change in well-being across time.

Method

Participants and procedure. The U.S. sample was from the third wave of the MIDUS project (MIDUS 3; 2013–2014), the longitudinal follow-up study of MIDUS 2. The Japanese sample was from the second wave of the MIDJA project (MIDJA 2; 2012), the follow-up study of MIDJA 1. Participants with all demographic variables, predictor variable, and at least one outcome variable from both time points were included in the final analysis sample. As a result, the U.S. sample consisted of 1,075 adults (585 females; M_{T1age} = 55.66 years, range = 30–83 years). The final Japanese sample consisted of 623

Table 3. Descriptive Statistics of the Key Variables and Cultural Differences in Study 2.

	United States			Japan		
Variable	*N*	*M*	*SD*	*N*	*M*	*SD*
Age	1,075	55.66	11.29	623	54.39	13.32
Gender (% female)	1,075	54.4		623	52.4	
Education	1,074	4.76	1.65	618	4.36	1.63
Functional limitations	1,075	1.57	0.73	623	1.33	0.63
Personal control	964	0.25	0.52	479	−0.36	0.49
Autonomy	1,075	37.57	7.00	623	30.77	5.56
Environmental mastery	1,075	38.52	7.36	623	32.09	5.56
Personal growth	1,075	33.19	6.37	623	27.10	5.22
Positive relations with others	1,075	40.50	6.93	623	33.81	5.78
Purpose in life	1,075	38.99	7.03	623	31.87	5.19
Self-acceptance	1,075	38.33	8.34	623	31.24	5.84
Life satisfaction	1,075	7.54	1.24	623	6.26	1.53
Positive affect	1,070	3.52	0.67	618	3.21	0.69
Negative affect	1,064	1.51	0.49	618	1.76	0.60
T2 Autonomy	1,075	37.55	6.72	623	30.88	5.16
T2 Environmental mastery	1,075	38.29	7.56	621	31.97	5.17
T2 Personal growth	1,075	32.42	6.35	619	26.72	5.05
T2 Positive relations with others	1,075	40.38	6.81	621	33.66	5.52
T2 Purpose in life	1,075	38.00	7.21	621	31.43	4.84
T2 Self-acceptance	1,075	37.91	8.28	621	30.97	5.41
T2 Life satisfaction	1,075	7.52	1.37	623	6.25	1.59
T2 Positive affect	1,065	3.47	0.70	614	3.18	0.68
T2 Negative affect	1,052	1.48	0.52	615	1.79	0.62

Note. T2 = Time 2.

adults (329 females; M_{T1age} = 54.39 years, range = 30–79 years).

Measures. Along with the measures used in Study 1, we had additional measures of Time 2 (T2) well-being measures, both eudaimonic (autonomy: α_{US} = .69, α_{Japan} = .73; environmental mastery: α_{US} = .80, α_{Japan} = .76; personal growth: α_{US} = .75, α_{Japan} = .80; positive relations with others: α_{US} = .77, α_{Japan} = .79; purpose in life: α_{US} = .74, α_{Japan} = .58; self-acceptance: α_{US} = .84, α_{Japan} = .78) and hedonic (life satisfaction: α_{US} = .70, α_{Japan} = .78; positive affect: α_{US} = .93, α_{Japan} = .93; negative affect: α_{US} = .90, α_{Japan} = .91).

Results

Descriptive analysis. Descriptive statistics for the key variables are presented in Table 3. As in Study 1, the United States sample was older, $t(1{,}134.04) = 2.00$, $p < .001$; more educated, $t(1{,}609) = 4.86$, $p < .001$; and had higher FL, $t(1{,}451.25) = 7.36$, $p < .001$, than the Japanese sample. Both samples were comparable in gender (United States: 54.4% vs. Japan: 52.4%).

Cultural moderation of the link between FLs and well-being. The same set of hierarchical multiple regression analyses conducted in Study 1 were run to test the first hypothesis, but instead used Time 2 well-being as the outcome variable and additionally controlled for the respective Time 1 well-being. For all models, the main effect of culture was found across all but one well-being outcomes, $|t|$s > 5.53, ps < .006; except positive affect: β = −.11, $t(1{,}675) = -2.66$, n.s., whereas the main effect of FLs was found only for life satisfaction (see Supplemental Material C for details).

Partially supporting the first hypothesis, the Culture × FL interaction was significant for a subset of well-being measures: environmental mastery, β = .15, SE_β = .06, $t(1{,}682) = 2.80$, $p = .004$, 95% CI = [.04, .26], $R^2 = .007$; personal growth, β = .17, SE_β = .05, $t(1{,}680) = 3.25$, $p = .001$, 95% CI = [.07, .27], $R^2 = .010$; and purpose in life, β = .18, SE_β = .05, $t(1{,}683) = 3.38$, $p < .001$, 95% CI = [.08, .28], $R^2 = .010$ (Figure 3). Simple slope analyses for the significant interactions showed that the associations were significant in the United States but not in Japan: environmental mastery: $\beta_{US} = -.11$, $t_{US}(1{,}689) = -4.19$, $p_{US} < .001$, $\beta_{Japan} = .01$, $t_{Japan}(1{,}689) = .38$, n.s.; personal growth: $\beta_{US} = -.08$, $t_{US}(1{,}687) = -3.22$, $p_{US} = .001$, $\beta_{Japan} = .06$, $t_{Japan}(1{,}687) = 1.70$, n.s.; purpose in life: $\beta_{US} = -.09$, $t_{US}(1{,}690) = -3.78$, $p_{US} < .001$, $\beta_{Japan} = .04$, $t_{Japan}(1{,}690) = 1.17$, n.s.[5]

Personal control as a mediator. The same moderated mediation analyses using Time 1 personal control were conducted but with Time 2 (T2) well-being measures as the outcome

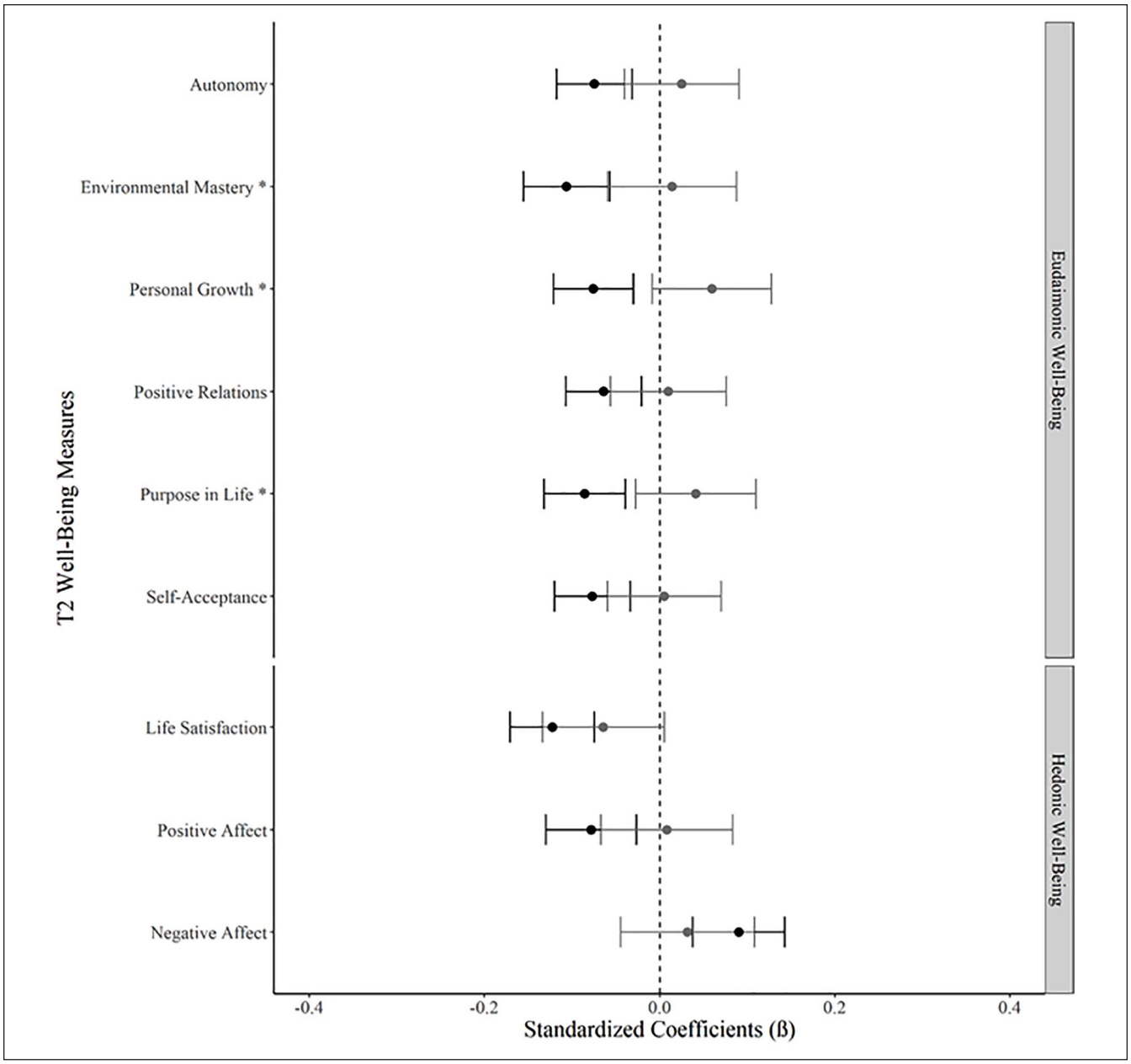

Figure 3. Cultural differences in association between T1 functional limitations and T2 well-being measures (controlling for T1 well-being measures) in Study 2.

Note. Dark line = United States; gray line = Japan; T1 = Time 1; T2 = Time 2; control variables: gender, age, education, and T1 well-being; well-being measures with an asterisk (*) indicate significant cultural moderation. Error bars represent standard errors.

and additionally controlling for the respective Time 1 well-being. The first step of the moderated mediation analyses was identical to Study 1,[6] where we found a significant Culture × FL interaction, β = .34, $t(1,429) = 4.23$, $p < .001$, 95% CI = [.18, .50]. The association between FLs and personal control was significant for the U.S. sample, β = −.30, $t(1,429) = -10.93$, $p < .001$, 95% CI = [−.35, −.25], but not for the Japanese sample, β = −.04, 95% CI = [−.11, .19], n.s.

As the second step, we ran another regression analysis testing the link between T1 personal control and T2 well-being measures, while also including the direct effect of the Culture × FL interaction on well-being measures. The results found personal control to be a significant predictor of the majority of well-being outcomes, except for life satisfaction, and negative affect: autonomy: β = .10, $t(1,392) = 4.46$, $p < .001$, 95% CI = [.06, .14]; environmental mastery: β = .18, $t(1,427) = 6.62$, $p < .001$, 95% CI = [.13, .23]; personal growth: β = .11, 95% CI = [.06, .15], $t(1,425) = 4.44$, $p < .001$; positive relations: β = .09, $t(1,427) = 4.10$, $p < .001$, 95% CI = [.05, .14]; purpose in life: β = .07,

Table 4. Results of the Bootstrapping Analysis for the Moderated Mediation Model in Study 2.

Model outcome	Moderated mediation index	*SE*	99.4% CI	
			Lower	Upper
T2 Autonomy	0.222	0.075	0.050	0.465
T2 Environmental mastery	0.326	0.109	0.082	0.685
T2 Personal growth	0.178	0.068	0.028	0.399
T2 Positive relations with others	0.229	0.071	0.071	0.453
T2 Purpose in life	0.153	0.064	0.017	0.373
T2 Self-acceptance	0.208	0.083	0.026	0.501
T2 Life satisfaction	0.022	0.012	−0.007	0.062
T2 Positive affect	0.016	0.007	0.002	0.039
T2 Negative affect	−0.006	0.005	−0.024	0.008

Note. CI = confidence interval; T2 = Time 2.

$t(1,428) = 2.90$, $p = .004$, 95% CI = [.02, .12]; self-acceptance: $\beta = .10$, $t(1,427) = 3.96$, $p < .001$, 95% CI = [.05, .14]; life satisfaction: $\beta = .07$, $t(1,434) = 2.64$, $p = .008$ (n.s.), 95% CI = [.02, .12]; positive affect: $\beta = .11$, $t(1,408) = 4.08$, $p < .001$, 95% CI = [.06, .17]; negative affect: $\beta = -.03$, $t(1,392) = -1.33$, .183 (n.s.), 95% CI = [−.08, .02].

Through a bootstrapping procedure, the moderated mediation was found for autonomy, environmental mastery, personal growth, positive relation with others, purpose in life, self-acceptance, and positive affect, which were in the same direction as in Study 1 (Table 4). Such findings suggest that FLs were associated with personal control in the United States, which then predicted higher T2 well-being; however, FLs were not associated with personal control in Japan, therefore lacking an indirect link through personal control. For moderated mediation models that were not supported (i.e., life satisfaction, negative affect), the indirect effect of personal control was not found for both groups, suggesting the weak link between T1 personal control and the T2 outcomes.

Discussion

Cross-cultural findings in Study 2 were generally in line with our predictions and cross-sectional findings from the Study 1, though the predicted cultural moderation was evident for a smaller number of well-being measures. That is, while the longitudinal associations between FLs and well-being measures were found for all measures of well-being in the United States and for none in Japan, significant cultural differences were found only for a subset of the measures (i.e., environmental mastery, personal growth, and purpose in life). Furthermore, results of the moderated mediation models with personal control as the mediator from Study 1 were replicated for six well-being measures, thus generally supporting the second hypothesis from Study 1 and generalizing it to the longitudinal data.

General Discussion

Using a representative sample from both United States and Japan, the present study is the first to highlight cross-cultural similarities and differences in the association between FLs and well-being. Consistent with previous work in the United States showing the association between FLs and well-being (Kunzmann et al., 2000; Lin & Wu, 2014; Okun et al., 1984; Steptoe et al., 2015; Taylor & Lynch, 2004), we found that FLs are cross-sectionally linked to lower well-being across cultures. At the same time, the association tends to be weaker in Japan than in the United States. The present study is also the first to test cross-time associations between FLs and well-being across cultures. The longitudinal associations for well-being measures were found only in the United States and not in Japan, though significant cultural differences in the associations were found only for three well-being measures.

Specifically, in the cross-sectional analyses (Study 1), despite cultural moderation, the association between FLs and well-being was found across cultures for most well-being measures. On the contrary, in the cross-time analyses (Study 2), the association between FLs and well-being was found across all well-being measures in the United States, but not in Japan. Therefore, while cross-sectional associations between FLs and well-being seem to exist across cultures, longitudinal associations are evident only in the United States. This may imply that although FLs are associated with well-being *concurrently* across the two cultures, FLs play a very limited role on their well-being over time within Japan.

The Mediating Role of Personal Control

The present study is also the first to observe the indirect association between FLs and well-being through personal control. Previous studies have shown the relationship between (a) FLs and personal control (Clarke et al., 2000; Drewelies

et al., 2017; Infurna et al., 2018; Infurna & Okun, 2015), (b) personal control and well-being (Infurna & Mayer, 2015; Lachman & Agrigoroaei, 2010; Lachman et al., 2011), and (c) FLs and well-being. While Infurna and Okun (2015) have observed antecedents and outcomes of personal control, respectively, no previous study has shown the mediating role of personal control in the link between FLs and well-being. By directly testing the indirect effect of personal control within the same model, the current study suggests poor functional health is related to lower well-being partly through lower personal control.

Importantly, we showed the moderating role of culture on the link between FLs and personal control. To our knowledge, cultural differences in the bases of personal control have not been shown before. Our findings suggest the possibility of cultural variation in a factor that predicts personal control by showing weaker associations between FLs and personal control among Japanese than U.S. individuals. Further studies are necessary to examine whether personal or relational factors do affect the development of personal control differently by cultural context.

We found personal control to be a significant predictor of the well-being outcomes across cultures. Previous cross-cultural studies have also found that the link between control and health are present across cultures, though the link sometimes was stronger in Western cultural contexts than in Asian cultural contexts (Kitayama et al., 2010; Sastry & Ross, 1998). We thus additionally explored whether the link between control and well-being was moderated by culture and found that although cultural moderation was found for two well-being outcomes (i.e., environmental mastery and self-acceptance) in Study 1 (and none in Study 2), there was a strong association in both cultures across all the well-being measures (except for purpose in life, life satisfaction, and negative affect in Study 2). Therefore, although personal control can be more characteristic of Western culture where independence and autonomy are emphasized (Lachman, 2006; Weisz et al., 1984), it seems to be strongly associated with eudaimonic and hedonic well-being across cultures.

Limitations and Future Directions

Limitations of the study must be considered. With regard to the sampling, the MIDJA sample was drawn only from the Tokyo metropolitan area, limiting the generalizability of the findings to all of Japan. The MIDUS sample is also majorly White, which also limits generalizability within the States. Future work with individuals with greater diversity in ethnic backgrounds will help increase generalizability of our findings. A second limitation is that the hypothesized mediator reflected only the Western cultural context. Future research needs to consider what factors in interdependent cultural contexts might mediate links between FLs and well-being or what factors might serve as a basis of personal control in interdependent cultural contexts, and thus can be linked to well-being in such cultural contexts.

In addition, although we found that personal control plays a mediating role in cultural moderation of the association between FLs and well-being in most of the cases, other factors may also play a role. For example, density of social network or availability of practical health may play a role in the observed cultural differences. While direct measures of these were not available, we conducted additional analyses that controlled for perceived social support (i.e., combined score of perceived support from spouse, family, and friend). The interactions between culture and FLs that were significant in the original analyses remained significant even after controlling for perceived support, suggesting that perceived social support was not driving the observed cultural differences. It is also possible that health behavior such as engaging in exercise may also underlie the cultural differences. It is important for future research to examine such other potential mechanisms that could explain cultural differences in the link between FLs and well-being beyond personal control.

Also, in the cross-time analyses (Study 2), significant cultural moderation of the association between FLs and well-being was found only among three of the eudaimonic well-being measures (i.e., environmental mastery, personal growth, purpose in life), and none for the hedonic well-being measures. Although future research needs to identify potential reasons for such differences among well-being measures, the analyses of personal control—our proposed mediator of the link between FLs and well-being—provide useful evidence. Personal control played a mediating role for all eudaimonic well-being measures, but not for two hedonic well-being measures, mostly because personal control did not predict two hedonic well-being measures. Present findings thus imply a possibility that cultural moderation of the longitudinal link between FL and well-being is evident more for eudaimonic than for hedonic well-being measures partly because personal control is more strongly linked to eudaimonic well-being than to hedonic well-being over time.

Conclusion

Prior studies showing that decline in functional health is associated with worse well-being (e.g., Kunzmann et al., 2000; Lin & Wu, 2014; Steptoe et al., 2015) through a decline in personal control have been focused only on Western countries. Our findings not only showed that FLs negatively predicted well-being in both countries, but also revealed meaningful cultural differences with the role of FLs being stronger in the U.S. sample than in that of Japan. Moreover, our findings show that such cultural differences happen partly through cultural moderation of the path from FLs to personal control. Our findings provide areas for future work on how culture affects the relationship between health and well-being, and the mechanism of personal control by which

health is related to well-being. Such findings contribute to an enriched understanding of how health status and well-being are related across varying cultures.

Declaration of Conflicting Interests

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Supplemental Material

Supplemental material is available online with this article.

Notes

1. The excluded item was the following: "I sometimes feel as if I've done all there is to do in life." This item loaded negatively on the purpose in life in the U.S. sample, whereas it loaded positively in the Japanese sample.
2. Considering the low average of functional limitations (FLs) across both samples (United States: $M = 1.68$, $SD = .81$; Japan: $M = 1.40$, $SD = .72$), we also examined the percentage of people who reported having FLs or not. There was a higher percentage of people in the U.S. sample (77%) who reported having FLs compared with that in the Japanese sample (53.3%), $\chi^2(1) = 167.51$, $p < .001$. The average age and gender composition by FL did not, however, differ between the two samples: age of respondents with FLs (United States: $M = 58.97$, $SD = 12.31$; Japan: $M = 59.01$, $SD = 13.41$) and without FLs (United States: $M = 49.01$, $SD = 10.02$; Japan: $M = 48.68$, $SD = 12.78$); gender composition among respondents with FLs (US_{Female}: $Japan_{Female} = 56.4$: 53.3) and without FLs (US_{Female}: $Japan_{Female} = 48.4$: 48.1). Cultural differences in FLs are in line with the epidemiological data showing cultural differences in overall physical health, not only in terms of FLs but also regarding life expectancy, between Japan and the United States (United Nations, 2017; World Health Organization, 2011).
3. While such cultural main effects are in line with previous studies that showed cultural differences in the level of well-being (Diener et al., 2003), such results could also reflect cultural differences in response styles (e.g., Hamamura et al., 2008) and thus need to be interpreted with caution.
4. Additional follow-up analyses were conducted for well-being measures with insignificant interactions (i.e., autonomy and positive relations with others) to examine the simple slope within each culture group. Results showed that the associations were significant for both well-being measures in the United States, but only for positive relations with others in Japan: autonomy: $b_{US} = -.08$, $t_{US}(2,765) = -3.86$, $p_{US} < .001$, $b_{Japan} = -.04$, $t_{Japan}(2,765) = -1.14$, n.s.; positive relations with others: $b_{US} = -.13$, $t_{US}(2,765) = -6.21$, $p_{US} < .001$, $b_{Japan} = -.12$, $t_{Japan}(2,765) = -2.53$, $p_{Japan} < .001$.
5. Follow-up analyses for well-being measures with insignificant interactions also showed that the associations were present in the U.S. sample but not in the Japanese sample: autonomy: $\beta_{US} = -.07$, $t_{US}(1,691) = -3.36$, $p_{US} = .001$, $\beta_{Japan} = .03$, $t_{Japan}(1,691) = .75$, n.s.; positive relations: $\beta_{US} = -.06$, $t_{US}(1,689) = -2.86$, $p_{US} = .004$, $\beta_{Japan} = .01$, $t_{Japan}(1,689) = .29$, n.s.; self-acceptance: $\beta_{US} = -.08$, $t_{US}(1,689) = -3.46$ $p_{US} < .001$, $\beta_{Japan} = .01$, $t_{Japan}(1,689) = .16$, n.s.; life satisfaction: $\beta_{US} = -.12$, $t_{US}(1,704) = -4.94$, $p_{US} < .001$, $\beta_{Japan} = -.06$, $t_{Japan}(1,704) = -1.80$, n.s.; positive affect: $\beta_{US} = -.08$, $t_{US}(1,675) = -2.92$, $p_{US} = .004$, $\beta_{Japan} = .01$, $t_{Japan}(1,675) = .22$, n.s.; negative affect: $\beta_{US} = .07$, $t_{US}(1,658) = -3.41$, $p_{US} = .001$, $\beta_{Japan} = .02$, $t_{Japan}(1,658) = .81$, n.s.
6. Exact statistics are slightly different due to change in sample size from Study 1 ($n = 2,785$) to Study 2 ($n = 1,830$).

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