Journal of Personality and Social Psychology

What Social Lives Do Single People Want? A Person-Centered Approach to Identifying Profiles of Social Motives Among Singles

Yoobin Park, Geoff MacDonald, Emily A. Impett, and Rebecca Neel

Online First Publication, January 5, 2023. https://dx.doi.org/10.1037/pspp0000455

AMERICAN PSYCHOLOGICAL ASSOCIATION

Journal of Personality and Social Psychology:
Personality Processes and Individual Differences

ISSN: 0022-3514

https://doi.org/10.1037/pspp0000455

What Social Lives Do Single People Want? A Person-Centered Approach to Identifying Profiles of Social Motives Among Singles

Yoobin Park[1], Geoff MacDonald[1], Emily A. Impett[2], and Rebecca Neel[1]
[1] Department of Psychology, University of Toronto, Toronto
[2] Department of Psychology, University of Toronto, Mississauga

Despite the worldwide increase in unpartnered individuals (i.e., singles), little research exists to provide a comprehensive understanding of the heterogeneity within this population. In the present research (N = 3,195), we drew on the fundamental social motives framework to provide a theory-based description and understanding of different "types" of single individuals. Across two Western samples (primarily European and American) and one Korean sample (all collected during the COVID-19 pandemic in 2020–2021), we identified three groups of singles with relatively consistent motivational patterns: (a) singles with strong independence motives and little interest in affiliation, mating, or status (i.e., independent profile); (b) singles with great interest in self-protection as well as social connections and status (i.e., socially focused profile); and (c) singles with little interest in self-protection but moderate interest in affiliation (i.e., low safety focus profile). Notably, these profile features did not perfectly replicate in one smaller Western sample collected before the pandemic (particularly the low safety focus profile), highlighting the need to interpret the data with the historical background in mind. Across samples, the independence-oriented group of singles consistently reported greater satisfaction with singlehood compared to other groups. The three groups of singles also showed substantial differences in other affective and behavioral variables (e.g., how they spend their social time). These findings advance the growing body of research on singlehood by offering new theoretical perspectives on different types of singles.

Keywords: singlehood, well-being, life satisfaction, partnership status, romantic relationship

As people spend an increasing amount of time unmarried (Organisation for Economic Co-Operation and Development [OECD], 2019) or living alone (OECD, 2016), a growing body of research is attending to the lives of unpartnered individuals (Adamczyk, 2021; Pepping & MacDonald, 2019), hereinafter referred to as "singles." With a large body of research focusing on comparing singles to partnered individuals (or unmarried to married individuals; e.g., Shapiro & Keyes, 2008), singles have often been treated as a monolithic group. However, emerging research has challenged this view by exploring within-group heterogeneity among singles (e.g., Fisher & Sakaluk, 2020) and suggesting the importance of this heterogeneity in understanding singles' well-being (Lehmann et al., 2015). Indeed, some attention has now been paid to what types of singles (e.g., voluntary vs. involuntary singles, Adamczyk, 2017; singles interested vs. not interested in dating, Beckmeyer & Cromwell, 2019) tend to fare better or worse. While this early work has provided valuable initial insights into within-group heterogeneity among singles, categorizing individuals based on one variable at a time arguably provides a narrow understanding of different types of singles. Further, most of this research lacks a unifying theory that can inform a psychological taxonomy of singles (cf. MacDonald & Park, 2022), limiting our ability to understand or explore how different types of singles' emotions and behaviors may differ.

One promising approach for better understanding singles' well-being involves considering variation in their social motivations. Social experiences are an important element of people's lives in general (Feeney & Collins, 2014), and as such should be expected to be an important element of satisfying single lives. Indeed, research has suggested that single individuals who are satisfied with their social relationships tend to feel better about themselves and their lives (Fisher et al., 2021; Girme et al., in press; Park et al., 2021). Importantly, social relationships can play a variety of roles in an individual's life and the desire to approach or avoid social experiences can involve a variety of specific motivations. However, perhaps because a defining feature of singlehood is the absence of a

Yoobin Park https://orcid.org/0000-0002-2796-3523

This work was partly supported by funding from Grant AKS-2021-R086 from the Academy of Korean Studies awarded to Geoff MacDonald.

Yoobin Park played a lead role in conceptualization, data curation, formal analysis, project administration, visualization, and writing of original draft. Geoff MacDonald played a supporting role in writing of review and editing and an equal role in funding acquisition and supervision. Emily A. Impett played a supporting role in supervision and writing of review and editing. Rebecca Neel played a supporting role in writing of review and editing and an equal role in funding acquisition and supervision.

The authors have uploaded study materials, data, Mplus codes, and Supplemental Materials on the Open Science Framework (https://osf.io/3uwbm/).

Correspondence concerning this article should be addressed to Yoobin Park, Department of Psychology, University of Toronto, 100 Saint George Street, Toronto, ON M5S 3G3, Canada. Email: yoobin.park@mail.utoronto.ca

romantic partner, most attention in singlehood research has been paid to social motivations focused on dating and sexual connections (e.g., Kislev, 2021; MacDonald & Park, 2022). Considering that singles' priorities extend to domains beyond dating and sex, and in fact, that the dating and sex domains may be relatively low priorities for singles (Park & MacDonald, 2022), this narrow focus leaves an important gap in our understanding of singles' social motivations. Accordingly, the present research aimed to provide a more comprehensive and theory-driven account of single individuals' full range of social motives. Specifically, we applied the fundamental motives framework (Kenrick et al., 2010) as a means of thoroughly describing groups of singles and their motivations for pursuing or foregoing social relationships. This framework posits that humans evolved seven distinct social motivations to overcome the critical challenges of social life: self-protection, disease avoidance, affiliation, status seeking, mate acquisition, mate retention, and kin care. While each of these fundamental motives is proposed to serve essential evolutionary functions, there are also individual differences in the extent to which each motive is prioritized (Neel et al., 2016). The primary goals of the present research were to identify subgroups of single individuals with distinct patterns of fundamental social motives and examine whether these classes of singles show meaningful differences in important outcomes such as how satisfied they are with being single and how they spend their social time.

Extant Research on Singles as a Heterogeneous Group

One common research approach to understanding different types of singles and their well-being has been to draw on motivations or reasons for being single. For example, consistent with perspectives such as self-determination theory (Deci & Ryan, 2000), the sense of choice or autonomy over being single has been related to more positive outcomes. Specifically, those who consider themselves to be more voluntarily single tend to report fewer mental health issues and less romantic loneliness compared to those who attribute their singleness to external circumstances (i.e., more involuntarily single; Adamczyk, 2017). Similarly, those who are higher in fear of being single (Spielmann et al., 2013), that is, those who are likely to be single less voluntarily, are lonelier and less satisfied with being single (Adamczyk, 2018). Although this approach based on motivations for being single holds promise, the resulting taxonomy offers a somewhat narrow understanding of different types of singles. That is, because this approach fundamentally distinguishes singles based on their attitudes toward singlehood (i.e., perceptions of choice over or fear of singlehood), it provides little information about what each group of singles looks like outside of domains directly related to romantic relationship status.

Pepping et al. (2018), on the other hand, proposed classifying singles based on more general motivations by employing attachment theory (Bowlby, 1982). They suggested that from an attachment theory perspective, long-term singles might usefully be classified into three subgroups characterized by attachment security, anxiety, and avoidance. For individuals high in attachment security, long-term singlehood was proposed to likely be a personal choice whereby attachment needs are met in alternative (nonromantic) relationships. They proposed that securely attached singles would feel comfortable relying on others for support and have good relationships with close others (e.g., friends) that can provide such support. Indeed, high attachment security appears to be associated with greater satisfaction with both life and singlehood (MacDonald & Park, 2022). On the other hand, for individuals high in attachment anxiety (characterized by heightened sensitivity to rejection and worry about others' feelings about them) or attachment avoidance (characterized by a preference for independence rather than intimacy with others; Mikulincer & Shaver, 2016), long-term singlehood may be a result of relational instability or their own or potential partners' lack of interest in maintaining a committed relationship. Consistent with this idea, research suggests that singles higher in attachment anxiety report lower life and singlehood satisfaction; those higher in attachment avoidance also report lower life satisfaction (but not particularly low satisfaction with singlehood; MacDonald & Park, 2022).

Nevertheless, an attachment perspective might not be well suited to provide a full understanding of singles' social motivations to the extent that this perspective is primarily focused on a single motivational tendency tied to affiliation. In addition to not allowing for differentiation across affiliative motives toward different types of social partners (e.g., caring for family vs. belonging to a group vs. finding a romantic partner), an attachment perspective does not adequately incorporate nonaffiliative social motives that may manifest in singles' approaches to various relationships. Indeed, as with anyone, singles' social lives include diverse and complex opportunities and challenges such that one global orientation tied to affiliation may not be sufficient to gain full insight into the motivations and choices that arise in singles' social lives. For example, variability in the affiliation motive cannot fully explain why one might skip a family dinner to attend a party with colleagues or the common dilemma that arose as part of the COVID-19 pandemic (which heightened disease as a salient concern) regarding whether and how intimately one would be willing to interact with strangers. Indeed, understanding social experiences during the pandemic is almost impossible without considering the motivation for avoiding diseases. Overall, an important step to developing a fuller understanding of singles' social lives and experiences appears to involve accounting for the varying types and levels of social motives they have.

Fundamental Social Motives

The fundamental social motives framework (Kenrick et al., 2010) helps capture a broad array of social motivations by taking a functionally specific approach to understanding human motivation (Cosmides & Tooby, 2013). This framework posits that there exist a set of motivations, each of which evolved to solve certain adaptive problems and are guided by rules specific to their respective domains. The key premise underlying this framework's conceptualization of motives is that humans, as a social species, have faced recurrent challenges that involve other individuals. For example, people have had to protect themselves from potentially dangerous others while also trying to maintain good relationships with community members (Kenrick et al., 2010). As a response to social life's array of challenges, different motivational systems are theorized to have evolved to protect from harm, avoid disease, affiliate with others, attain status, acquire a partner, maintain the pair bond, and care for the family.

Importantly, Neel et al. (2016) have demonstrated that people differ in the extent to which each motive is active and that this variability is meaningfully related to (but not redundant with) personality traits. For example, the motive of status seeking was associated with the trait of dominance (i.e., the tendency to use

intimidation and coercion to attain social status; Cheng et al., 2010), while the motive of mate seeking was associated with trait orientation toward short-term mating (Jackson & Kirkpatrick, 2007). Moreover, individual differences in the strength of each motive were also related to actual events or behaviors in people's lives. For example, individuals high in the self-protection motive were more likely to have taken a self-defense class in the past year; those high in the disease avoidance motive were more likely to have avoided shaking hands with someone looking sick.

While Neel et al. (2016) findings demonstrated the value of using social motives to extend our understanding of individuals' personalities and even predict their behaviors, it is noteworthy that these motives do not exist or operate in isolation. Not only will pursuing each of these motives essentially involve trade-offs but successful pursuit of one motive may even entail suppression of another (e.g., Sacco et al., 2014). Such interplay of multiple motives can in turn have important implications for one's emotions and behaviors. For example, because leaving home to date potential partners during the pandemic increases the risk of getting infected, singles who have strong mate seeking as well as disease avoidance motives are likely to experience more emotional and behavioral conflict than those who strongly pursue one motive but not the other. Further, even among those pursuing both motives, there may be other motives (e.g., for independence) that influence how their internal conflict resolves itself, highlighting the need to account for the interplay of all the motives in this framework. However, we currently lack any descriptive information on what types of social motives coexist within the single population. Thus, in order to gain a full understanding of what configurations of social motives exist among single individuals and how they are related to important outcomes, we conducted latent profile analyses (LPA) on data from four separate samples of singles.

Research Overview

LPA estimates what common profiles, or combinations of responses, exist within a data set. Applied to singles' motives, this approach can reveal whether there are different groups of singles who tend to share a similar set of motives. LPA is particularly suitable for the present research as rather than assuming sample homogeneity (as do variable-centered analyses), it focuses on the possibility that the sample consists of qualitatively distinct subpopulations. LPA is considered probabilistic (Morin et al., 2020), meaning that it allows for the categorization of individuals by estimating each individual's probability of belonging to each profile. LPA is also exploratory in nature as selection of the optimal solution (i.e., a solution with the most reasonable number and structure of profiles) is made based on comparing a number of alternative solutions. These features of LPA make it particularly important to (a) validate the retained profile solution using a range of covariates (i.e., examine whether the profiles are associated with other variables in a theoretically compelling way) and (b) replicate the findings using a different sample. Accordingly, in this research, we conducted LPA and examined the links between profile membership and other variables in multiple samples of single individuals. In Studies 1–3, we assessed single individuals' overall well-being (satisfaction with life, satisfaction with singlehood) to examine if the motivational profiles relate to life outcomes in a meaningful way. Given the importance of social experiences in singles' well-being (e.g., Park et al., 2021), it seemed reasonable to expect well-being variables to correlate with social motivational patterns. In Studies 2 and 3, we assessed more specific feelings and desires related to singlehood as well as social behaviors, which could help us understand any profile differences in overall well-being.

Study 1

Method

Participants and Procedure

All data, study materials, Mplus codes, and Supplemental Material can be found at https://osf.io/3uwbm/. All studies reported in this article were approved by the Ethics Review Board at the University of Toronto. Data collection for this study took place in December 2020. This was when COVID-19-associated hospitalizations and mortality were still on the rise both in the United States and Europe, and vaccinations began (Centers for Disease Control and Prevention [CDC], 2020; European Centre for Disease Prevention and Control [ECDC], 2020). Although there is no simple formula for estimating power for LPA, some research suggests a minimum sample size of 300–500 (Ferguson et al., 2020). To ensure that we had adequate statistical power, we aimed to recruit a sample of 900 individuals, relatively equally distributed across gender (men and women) and including equal numbers of participants from four age groups (the 20s, 30s, 40s, and 50s+). A total of 990 eligible participants (10% addition accounting for possible exclusions) who were at least 20 years old and not currently in a romantic relationship participated in the survey via Prolific Academic. Among participants who approved the use of their data, after excluding those who failed at least one attention check or reported having provided dishonest responses, there were 942 participants whose responses were available for analysis. The average approval rate of these participants' task on Prolific was 99% (minimum = 85%).

The final sample consisted of 463 men, 473 women, two nonbinary, and four participants who did not disclose or indicated other. Participants were 37.76 years old on average (SD = 11.65; range = 20–75). With multiple responses allowed, 755 participants identified as Caucasian, 57 as Latino/Hispanic, 35 as African, 31 as other, 31 as East Asian, 25 as Middle Eastern, and 17 as South Asian. As we did not directly ask about participants' cultural background in this study, we referred to their background information available in Prolific. For about half of our participants, either the country of birth or country of residence was identified as the United Kingdom or the United States. Full information can be found in the Supplemental Material. Most participants (n = 911) were never-married singles, with 22 having divorced once, six having divorced multiple times, and two were widowed.

Measures: Profile Indicators

Fundamental Social Motives. All participants completed eight subscales (each consisting of six items) from the Fundamental Social Motives Inventory (FMI; Neel et al., 2016). Note that among the 11 subscales of the FMI, three related to mate retention or parenting were not included in the survey as they were not relevant to (all) singles. The internal consistency was high for all subscales as follows: self-protection (e.g., "I think a lot about how to stay safe from dangerous people"; α = .88), disease avoidance (e.g., "I avoid

places and people that might carry diseases"; α = .88), affiliation—group (e.g., "I enjoy working with a group to accomplish a goal"; α = .86), affiliation—exclusion concern (e.g., "I would be extremely hurt if a friend excluded me"; α = .89), affiliation—independence (e.g., "Having time alone is extremely important to me"; α = .84), status (e.g., "It's important to me that other people look up to me"; α = .81), mate seeking (e.g., "I spend a lot of time thinking about ways to meet possible dating partners"; α = .93), and kin care—family (e.g., "It is extremely important to me to have good relationships with my family members"; α = .92). All items were assessed on a 7-point scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Measures: Predictors

Background Variables. Four variables assessed at background were examined as predictors of profile membership. These include gender (men vs. women), age, dating history (have vs. have not been in a relationship before), and marital history (ever vs. never been married). Note that given the limited number of individuals belonging to the "other" category for gender ($n = 6$), we dropped them from the analysis including gender. The number of divorced and widowed individuals was also small ($n = 30$), thus we collapsed ever-married individuals into one category. We kept these individuals in the model given previous work suggesting potential differences in never-married versus ever-married individuals' social networks (Pinquart, 2003).

Attachment Insecurity. The Experiences in Close Relationships–Relationship Structures questionnaire (Fraley et al., 2011) was used to assess global (i.e., relationship-general) attachment insecurity. Participants responded to six items assessing attachment avoidance (e.g., "I don't feel comfortable opening up to others"; α = .86) and three items assessing attachment anxiety (e.g., "I often worry that other people do not really care for me"; α = .88) on a 7-point scale (1 = *strongly disagree*; 7 = *strongly agree*).

Fear of Being Single. Participants responded to the Fear of Being Single scale (Spielmann et al., 2013) which includes six items such as "I feel anxious when I think about being single forever" (α = .85). The items were rated using a 5-point scale (1 = *not at all true*; 5 = *very true*).

Measures: Outcomes

Satisfaction With Being Single. The Satisfaction With Relationship Status Scale (Lehmann et al., 2015) was used to measure satisfaction with being single. Participants were asked to think about their current relationship status (which, for all the participants, would be being single) and respond to questions such as "How happy are you with your current status?" (α = .92) using a 4-point scale (1 = *not at all*; 4 = *to a great extent*).

Life Satisfaction. Participants responded to the Satisfaction With Life Scale (Diener et al., 1985) using a 7-point scale (1 = *strongly disagree*; 7 = *strongly agree*). Items include five statements such as "In most ways my life is close to my ideal" (α = .89). Correlations among all study variables can be found in the Supplemental Material.

Data Analysis

All analyses were conducted using the Mplus 8.5 (Muthén & Muthén, 1998–2017) and using the robust maximum likelihood estimator and full information maximum likelihood procedures to handle missing data (Enders, 2010).

Measurement Models. Prior to conducting the LPA, we conducted preliminary analyses estimating different measurement models for the FMI. Specifically, we estimated a confirmatory factor analytic model (CFA) and an exploratory structural equation model (ESEM) to represent the measurement structure. In CFA, each item is only allowed to load on the factor it is assumed to measure, with no cross-loadings. That is, this model estimates eight motives represented (only) by their respective items. When modeling responses to a multidimensional measurement as in the case of FMI, however, this may be an overly restrictive assumption as each item is likely associated with more than one factor, which in turn can result in biased estimation of model parameters (e.g., inflated factor correlations). ESEM addresses this limitation by targeting the cross-loadings to be as close to zero as possible but not forcing them to be zero as in CFA. Thus, in this model, the eight motives are primarily represented by their respective items, but possibly and to some degree, other items as well.[1] Factor scores from the better-fitting model were used for the subsequent analyses as they account for measurement errors better than composite variables (Meyer & Morin, 2016). In all four studies we report, we used factor scores from the ESEM. Please see the Supplemental Material, for full details on the measurement model results.

Latent Profile Analysis. We examined a series of LPA models estimating one to eight profiles. Given the exploratory nature of the person-centered analyses, an optimal solution is chosen by contrasting a number of profiles. Means and variance of the motives were freely estimated in all profiles. Analyses were conducted with 1,000 unique start values, 250 best solutions retained for final optimization, and 500 maximum iterations (Ferguson et al., 2020). Mplus codes were adapted from Ferguson et al. (2020) and Morin and Litalien (2019) and can be found along with the data on https://osf.io/3uwbm/. The decision regarding the optimal solution was made based on multiple criteria including the substantive meaningfulness of the profiles (e.g., theoretical meaningfulness, heuristic value, parsimony) as well as statistical adequacy (Morin & Litalien, 2019; Nylund et al., 2007). We inspected the Akaike information criterion (AIC), the constant AIC (CAIC), the Bayesian information criterion (BIC), and the sample size–adjusted BIC (SABIC), and when their values did not reach a minimal point as is often the case with large samples, the point at which their change flattens out was examined via an elbow plot (Morin & Marsh, 2015). We also inspected the adjusted Lo, Mendell, and Rubin likelihood ratio test (LMR) and the bootstrapped likelihood ratio test (BLRT), which compare a k-profile model versus a $k - 1$ profile model. A nonsignificant p value suggests that the more parsimonious model should be selected. Although we report all indicators for completeness as is conventionally done in the literature, simulation studies that examined the effectiveness of these indicators have supported the utility of BIC, CAIC, SABIC, or BLRT over AIC and LMR, which appear relatively unreliable (Diallo et al., 2017; Tein et al., 2013; Yang, 2006).

[1] Given the lack of a theoretical reason to expect the presence of a global factor underlying all motives, modeling a global factor underlying all items (i.e., bifactor models) did not seem reasonable. Indeed, when we nevertheless examined bifactor counterparts of the CFA and ESEM models, not all items loaded strongly on the global factor, and the improvement in fit was minimal (see the Supplemental Material).

After the optimal solution was selected, we further examined its meaningfulness by linking the profile membership to a set of covariates. We first examined how (conceptual) predictors are linked with profile membership using multinomial logistic regression models. Specifically, we examined gender, age, dating and marriage history, attachment insecurity, and fear of being single as possible predictors. We also examined how the profiles differ in important outcomes using the Bolck–Croon–Hagenaars approach method (Bakk et al., 2013; implemented by specifying auxiliary variables in Mplus; Asparouhov & Muthén, 2014). This allowed for testing the mean differences in satisfaction with singlehood and life satisfaction across the profiles using weights that reflect the measurement error of the profile membership. Given the number of tests, false discovery rate correction (set at $\alpha = .05$; Benjamini & Hochberg, 1995) was used.

Results

Profile Analyses

The fit statistics for one- to eight-profile solutions from the LPA are summarized in Table 1. SABIC and BLRT continued to favor a more complex solution, while BIC and CAIC seemed to support a seven- and six-profile solution, respectively. Inspecting the elbow plot (see Supplemental Figure S1) suggested decreases in all information criteria tended to flatten out around three- and four-profile solutions. We carefully examined both solutions and concluded that the addition of the fourth profile reflected division of an existing profile into smaller, less interpretable profiles. Specifically, the profile with high independence motive in the three-profile solution was divided into two profiles, both with a defining feature of high independence motive and no substantial differences in other motives (i.e., absence of a motive significantly higher than zero in one profile and lower than zero in the other). Thus, the three-profile solution was retained. This model yielded a moderate entropy value (0.72), with average probabilities for assignment to the most likely profile membership varying from .87 to .90. The final profile structures are depicted in Figure 1 (left).

Profile Descriptions. Profile 1 comprised 28% of the total sample ($n = 260$) and was characterized by high levels of independence, average levels (i.e., not significantly different from 0) of self-protection and disease avoidance, and low levels of group affiliation, exclusion concern, status, mate seeking, and kin care motives. This profile was labeled as *independent singles*. Profile 2 included 33% of the total sample ($n = 307$) and was characterized by relatively high levels of all motives except for independence. This profile thus was labeled as *socially focused singles*. Last, Profile 3 was characterized by low levels of self-protection, disease avoidance, and independence, and high levels of group motive, combined with average levels of exclusion concern, status, mate seeking, and kin care motives. This profile comprised 40% of the sample ($n = 375$) and was labeled as *low safety focus singles*.

Links With Predictors. Results from multinomial logistic regression models are shown in Table 2. Each model examined the effects of the predictors on the probability of being assigned to one profile (one listed first) versus the other. For example, a positive coefficient in the first model indicates that those scoring higher on the predictor were more likely to be assigned to Profile 1 (*independent singles*) than Profile 2 (*socially focused singles*).

Being a woman was associated with greater likelihood of being assigned to the *independent singles* or *socially focused singles* profiles than the *low safety focus singles* profile. Put differently, women were less likely to belong to the *low safety focus singles* profile than the other two profiles. Further, older people were more likely to belong to the *independent singles* profile than the other two profiles and less likely to belong to the *socially focused singles* profile than the other two. Last, having ever been in a romantic relationship was associated with greater likelihood of belonging to the *socially focused singles* or the *low safety focus singles* than the *independent singles* profile. In other words, those who had never been in a relationship were more likely to be a member of the *independent singles* profile. No significant association was found with marital history.

With regard to attachment orientations, individuals high in attachment anxiety were more likely to belong to the *socially focused singles* profile than the other two. In contrast, those high in attachment avoidance were more likely to belong to the *independent singles* profile and less likely to belong to the *socially focused singles* profile than the *independent* or *low safety focus singles* profiles. Finally, fear of being single showed a similar pattern of results as attachment anxiety in that those high in fear of being single were more likely to belong to the *socially focused singles* profile than the other two. In addition, these individuals were less likely to belong to the *independent singles* profile than the other two profiles.

Links With Outcomes. Overall, there was a significant difference in satisfaction with singlehood between the profiles, $\chi^2(2) = 66.61$, $p < .001$, such that *independent singles* ($M = 0.52$, $SE = 0.08$)

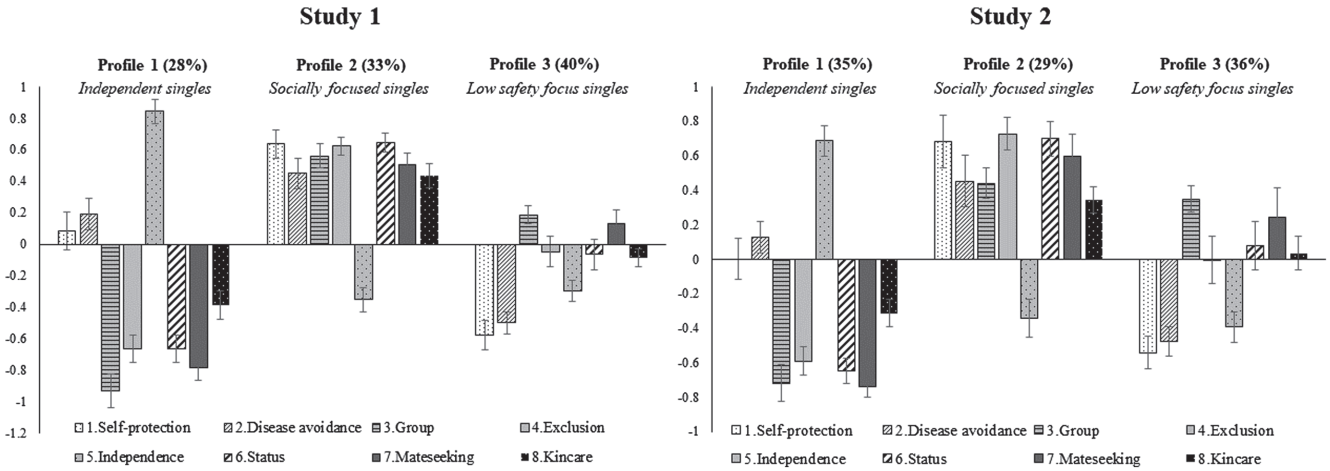
Table 1
Fit Indices for LPA Models (Study 1)

Profile estimated	LL	AIC	BIC	CAIC	SABIC	Entropy	LMR *p* value	BLRT *p* value	Smallest *n*%
One profile	−10307.67	20647.33	20724.90	20740.90	20674.09				
Two profiles	−9836.31	19738.62	19898.60	19931.60	19793.80	0.72	<.001	<.001	38%
Three profiles	**−9648.40**	**19396.80**	**19639.20**	**19689.20**	**19480.40**	**0.72**	**<.001**	**<.001**	**28%**
Four profiles	−9553.80	19241.61	19566.42	19633.42	19353.64	0.75	.09	<.001	18%
Five profiles	−9466.19	19100.37	19507.60	19591.61	19240.83	0.78	.19	<.001	4%
Six profiles	−9391.36	18984.71	19474.36	19575.36	19153.59	0.76	.21	<.001	4%
Seven profiles	−9331.48	18898.97	19471.03	19589.03	19096.27	0.77	.61	<.001	1%
Eight profiles	−9281.88	18833.76	19488.24	19623.242	19059.49	0.77	.29	<.001	5%

Note. LPA = latent profile analyses; LL = model log likelihood; AIC = Akaike information criterion; BIC = Bayesian information criterion; CAIC = consistent AIC; SABIC = sample size–adjusted BIC; LMR = adjusted Lo, Mendell, and Rubin likelihood ratio test; BLRT = bootstrapped likelihood ratio test. The solution considered to be optimal is bolded.

Figure 1

The Mean Levels of the Motives Across the Profiles in Study 1 (Left) and Study 2 (Right)



Note. Profile indicators are estimated from factor scores with a mean of 0 and a standard deviation of 1. Error bars indicate standard errors. The italicized labels have been added to facilitate interpretations across the studies.

were more satisfied than the *socially focused singles* ($M = -0.27$, $SE = 0.06$); $\chi^2(2) = 62.22$, or the *low safety focus singles* ($M = -0.13$, $SE = 0.05$); $\chi^2(2) = 41.56$, $p < .001$; the latter two did not significantly differ from each other, $\chi^2(2) = 2.48$, $p = .12$. In terms of life satisfaction, there was no difference between the three profiles, $\chi^2(2) = 1.56$, $p = .46$.

Study 2

The primary aim of Study 2 was to replicate the profile structures observed in Study 1. We also assessed more outcomes that can provide a better understanding of each profile. Specifically, to follow up on potential differences in satisfaction with singlehood across profiles, we assessed participants' positive and negative attitudes toward singlehood (coexistence of which may be considered as ambivalence) along with their draw toward partnership (as well as toward marriage and children which typically require a committed partnership). These variables can provide insights into the different forces underlying the link between singles' motivational profiles and broader satisfaction with their current state (e.g., do differing levels of satisfaction with singlehood co-occur with differences in positive feelings about singlehood, negative feelings about singlehood, or both?). Finally, to explore the behavioral implications of the motivational configurations, we also asked participants how they spend their free time.

Method

Participants and Procedure

All data were collected in April 2021. This was when vaccination was widely promoted and more than one third of the adult population in the United States and European Union/European Economic Area population had received at least one dose of a COVID-19 vaccine (CDC, 2021; ECDC, 2022). Participants were recruited from Prolific as in Study 1. Only individuals who did not participate in Study 1 were able to see the ad for this study. Participants were required to be at least 20 years old and not currently in a relationship. We aimed to recruit 900 individuals, equally distributed across men

Table 2

Results From Multinomial Logistic Regressions (Study 1)

	Profile 1 versus Profile 2 (independent vs. socially focused singles)		Profile 1 versus Profile 3 (independent vs. low safety focus singles)		Profile 2 versus Profile 3 (socially focused vs. low safety focus singles)	
Variable	Coefficient (*SE*)	*OR* [95% CI]	Coefficient (*SE*)	*OR* [95% CI]	Coefficient (*SE*)	*OR* [95% CI]
Gender (woman)	0.22 (0.27)	1.24 [0.74, 2.10]	0.74 (0.23)**	2.11 [1.35, 3.29]	0.53 (0.22)*	1.69 [1.11, 2.59]
Age	0.08 (0.01)**	1.08 [1.06, 1.11]	0.04 (0.01)**	1.04 [1.02, 1.06]	−0.04 (0.01)**	0.96 [0.94, 0.98]
Dating history (ever dated)	−0.67 (0.29)*	0.51 [0.29, 0.91]	−0.53 (0.25)*	0.59 [0.36, 0.96]	0.15 (0.26)	1.16 [0.70, 1.91]
Marital history (ever married)	0.81 (0.96)	2.25 [0.35, 14.59]	0.63 (0.89)	1.88 [0.33, 10.86]	−0.18 (0.60)	0.84 [0.26, 2.71]
Attachment anxiety	−0.43 (0.10)**	0.65 [0.54, 0.79]	−0.04 (0.08)	0.96 [0.82, 1.13]	0.39 (0.08)**	1.47 [1.26, 1.73]
Attachment avoidance	1.15 (0.14)**	3.17 [2.41, 4.18]	0.63 (0.11)**	1.88 [1.51, 2.35]	−0.52 (0.10)**	0.59 [0.49, 0.72]
Fear of being single	−1.00 (0.14)**	0.37 [0.28, 0.49]	−0.70 (0.12)**	0.50 [0.40, 0.63]	0.30 (0.11)**	1.36 [1.09, 1.68]

Note. The coefficients and *OR*s reflect the effect of the predictor on the likelihood of membership into the first listed profile relative to the second listed profile. *SE* = standard error; CI = confidence interval.
* $p < .05$. ** $p < .01$.

and women, as well as across four age groups (the 20s, 30s, 40s, and 50s). Given the limited availability of participants who were in their 50s and met our criteria, however, we ended up loosening the criteria for the last age group to anyone older than 50 and younger than 65. Among the 900 individuals who completed the survey and approved using their data, we excluded those who failed at least one attention check or reported having provided any dishonest responses, retaining 869 individuals' responses for analysis. The average approval rate of these participants' task on the platform was 99% (minimum = 89%).

The final sample consisted of 430 men, 434 women, two nonbinary, and three unidentified individuals. The average age was 38.53 (SD = 11.78). With multiple responses allowed, the racial/ethnic background of the participants were as follows: Caucasian (n = 666), Latino/Hispanic (n = 73), African (n = 38), other (n = 37), South Asian (n = 29), East Asian (n = 26), Middle Eastern (n = 14), and Caribbean (n = 14). The majority of the sample were heterosexual (n = 708), with 72 individuals identified as bisexual, 48 gay or lesbian, nine queer, seven pansexual, and nine uncertain or questioning (19 unidentified). More than half of the participants reported that they primarily grew up in the United Kingdom (n = 330) or the United States (n = 197). Full distribution of the home country of the participants can be found in the Supplemental Material. Most participants had never been married (n = 653), with 161 who had divorced once, 29 who had divorced more than once, and 26 who were widowed. Twenty-six percent of the participants (n = 228) reported having a child.

Measures: Profile Indicators

Fundamental Social Motives. The same motive scale as in Study 1 was used. The internal consistencies of the subscales were as follows: self-protection (α = .89), disease avoidance (α = .87), affiliation—group (α = .89), affiliation—exclusion concern (α = .85), affiliation—independence (α = .86), status (α = .83), mate seeking (α = .93), and kin care—family (α = .91).

Measures: Outcomes

Life Satisfaction. The same scale was used to assess life satisfaction as in Study 1 (α = .91).

Satisfaction With Being Single. The same scale was used to assess satisfaction with singlehood as in Study 1 (α = .93).

Ambivalence Toward Singlehood. In addition to asking about overall satisfaction, we also assessed the degree to which participants feel ambivalence toward singlehood using six items adapted from Newby-Clark et al. (2002). For example, participants were asked to only consider the positive aspects of being single (ignoring the negative aspects) and rate how positive their evaluation is toward singlehood. Participants also rated how negative their evaluation is, not accounting for the positive aspects. Similar items assessing how favorable/unfavorable their evaluation is and helpful/hurtful singlehood is were presented in randomized blocks. For each dimension, the ambivalence score was calculated by squaring the less extreme evaluation and dividing it by the stronger evaluation (i.e., weak^2/strong) following Newby-Clark et al. (2002). The three scores were then averaged (α = .79). Note that this score was also correlated at .98 with the score computed using another well-used formula ($[P + N]/2 - |P - N|$; Thompson et al., 1995).

Desire for Relationship. We assessed participants' short-term and long-term relationship-related desire by asking how much they want to date, (re)marry, and have child(ren) in the near future or someday. As each question was getting at slightly different constructs (and their correlations were mostly moderate, ranging from r = .32 to r = .67), we did not average (any pair, triplet, or all of) the variables.

Time Spent Alone (vs. With Others). Participants were asked how they spend their free time and indicated what percentage of their time they spend by themselves and interacting with others (including virtual interactions). As the scores were to total 100%, this construct is by nature capturing the amount of time spent alone *relative to* time spent with others.

Time Spent With Different Interaction Partners. For all participants who reported spending at least 1% of their free time with others (which was all but one participant), a follow-up question was asked regarding with whom they interact. Specifically, participants reported what percentage of their social time they spend with (a) family, (b) friends, (c) people with whom they have professional (work or academic) relationships, (d) potential romantic partners, (e) potential sexual partners, and (f) others. As was the case in the assessment of time spent alone, these assessments were also by nature zero-sum as participants reported the *proportion* of their time allocated to each partner (totaling 100%). Correlations among all study variables can be found in the Supplemental Material.

Results

Table 3 summarizes the fit statistics for one- to eight-profile solutions and the elbow plot illustrating changes in the information criteria can be found in the Supplemental Material. While BIC and CAIC reached their lowest values at six- and five-profile solutions, respectively, SABIC or BLRT did not converge on a specific solution. The elbow plot suggested that the changes in the information criteria started to be negligible around three- to four-profile solutions. We carefully inspected the characteristics of both solutions as well as their practical value (i.e., their differences in links with other correlates; Morin & Litalien, 2019) and decided to retain the three-profile solution. This model yielded a moderate entropy value (0.71), with average probabilities for assignment to the most likely profile membership varying from .84 to .90.

Profile Analyses

Profile Descriptions. As depicted in Figure 1 (right), the profile structure was very similar to what we found in Study 1. Profile 1 (35% of the sample), a group of *independent singles*, was characterized by high levels of independence and low levels of group, exclusion concern, status, mate seeking, and kin care motives. Profile 2 (29% of the sample), labeled as *socially focused singles* profile, showed low levels of independence but high levels of all other motives. Last, Profile 3 (36% of the sample) consisted of *low safety focus singles*, who were low in self-protection, disease avoidance, and independence motives but high in group motive.

Links With Predictors. The results from the multinomial logistic regression models are shown in Table 4. Looking at the same set of background variables as in Study 1, all the effects observed as significant in Study 1 were replicated (conceptually, given that the profiles are arguably not identical). Being a woman

Table 3
Fit Indices for LPA Models (Study 2)

Profile estimated	LL	AIC	BIC	CAIC	SABIC	Entropy	LMR *p* value	BLRT *p* value	Smallest *n*%
One profile	−9516.34	19064.69	19140.97	19156.97	19090.15				
Two profiles	−9087.15	18240.30	18397.62	18430.62	18292.82	0.72	<.001	<.001	41%
Three profiles	**−8954.36**	**18008.73**	**18247.10**	**18297.10**	**18088.31**	**0.71**	**.07**	**<.001**	**28%**
Four profiles	−8839.02	17812.03	18131.44	18198.44	17918.67	0.75	.04	<.001	10%
Five profiles	−8761.28	17690.56	18091.02	18175.02	17824.25	0.78	.23	<.001	7%
Six profiles	−8696.81	17595.63	18077.13	18178.13	17756.38	0.79	.25	<.001	7%
Seven profiles	−8645.15	17526.29	18088.84	18206.84	17714.10	0.75	.48	<.001	8%
Eight profiles	−8591.60	17453.19	18096.79	18231.79	17668.06	0.77	.31	<.001	3%

Note. LPA = latent profile analyses; LL = model log likelihood; AIC = Akaike information criterion; BIC = Bayesian information criterion; CAIC = consistent AIC; SABIC = sample size–adjusted BIC; LMR = adjusted Lo, Mendell, and Rubin likelihood ratio test; BLRT = bootstrapped likelihood ratio test. The solution considered to be optimal is bolded.

was again associated with greater likelihood of belonging to the *independent singles* or *socially focused singles* profile than the *low safety focus singles* profile; age was associated with greater likelihood of belonging to the *independent singles* profile than the other two profiles and lower likelihood of belonging to the *socially focused singles* profile than the other two; having ever been in a relationship was associated with less likelihood of belonging to the *independent singles* than the *socially focused singles* or *low safety focus singles* profile. No significant association was found with marital history.

Links With Outcomes. Next, we examined how the three profiles differ in the key outcomes. As presented in Table 5, those in the *independent singles* profile were more satisfied with singlehood compared to those belonging to the other two profiles, consistent with what we found in Study 1. However, those in the *low safety focus singles* profile were also significantly more satisfied than those in the *socially focused singles* profile in the current sample. The results regarding ambivalence suggested a similar pattern such that those in the independent singles profile felt the least ambivalence toward singlehood. When looking closely into the positive and negative evaluations separately, they scored the highest in positivity and the lowest in negativity. Those in the *socially focused singles* profile scored higher in negativity than those in the *low safety focus singles* profile although the two profiles nevertheless were similar in terms of overall ambivalence.

In terms of relationship-related desire, those in the *socially focused* profile had the greatest desire whether it was dating, (re) marrying, or having a(nother) child in the distant future. Those in the *low safety focus singles* profile showed similarly high desire for marriage and a child in the near future. Those in the *independent singles* profile had the least desire to date, marry, or have a child in the near or distant future.

Unlike Study 1, there were also significant overall differences in life satisfaction between the profiles. Those in the *low safety focus singles* profile were the most satisfied with their life overall and those in the *independent singles* profile were the least satisfied. These results again seem to suggest that overall life satisfaction is distinct from being satisfied with singlehood specifically.

Turning to how single individuals spend time, although single individuals in general indicated spending more than half of their free time by themselves, $t(868) = 22.48$, $p < .001$, those in the *independent singles* profile reported spending the largest portion of the three groups by themselves. When looking at with whom they spend their time when they do interact with others, they appeared to allocate more social time to family or others compared to those in the other profiles. Further, these individuals allocated a similar proportion of their social time to their friends as those in the other profiles but relatively less time to people with whom they are professionally affiliated or can romantically or sexually connect.

Study 3

Across Studies 1 and 2, we found support for a three-profile solution best representing single individuals' social motives in

Table 4
Results From Multinomial Logistic Regressions (Study 2)

	Profile 1 versus Profile 2 (independent vs. socially focused singles)		Profile 1 versus Profile 3 (independent vs. low safety focus singles)		Profile 2 versus Profile 3 (socially focused vs. low safety focus singles)	
Variable	Coefficient (*SE*)	*OR* [95% CI]	Coefficient (*SE*)	*OR* [95% CI]	Coefficient (*SE*)	*OR* [95% CI]
Gender (woman)	0.14 (0.21)	1.15 [0.76, 1.74]	0.74 (0.21)**	2.09 [1.40, 3.14]	0.60 (0.23)**	1.82 [1.16, 2.86]
Age	0.07 (0.01)**	1.08 [1.05, 1.10]	0.03 (0.01)**	1.03 [1.01, 1.06]	−0.04 (0.01)**	0.96 [0.94, 0.98]
Dating history (ever dated)	−0.67 (0.27)*	0.51 [0.30, 0.86]	−0.80 (0.28)**	0.45 [0.26, 0.77]	−0.13 (0.30)	0.88 [0.50, 1.57]
Marital history (ever married)	−0.02 (0.42)	0.98 [0.43, 2.24]	−0.39 (0.47)	0.67 [0.27, 1.69]	−0.37 (0.60)	0.69 [0.22, 2.22]

Note. The coefficients and *OR*s reflect the effect of the predictor on the likelihood of membership into the first listed profile relative to the second listed profile. *SE* = standard error; CI = confidence interval.
* $p < .05$. ** $p < .01$.

Table 5
Associations Between Profile Membership and the Key Outcomes (Study 2)

Variable	Profile 1 (independent singles) *M* (*SE*)	Profile 2 (socially focused singles) *M* (*SE*)	Profile 3 (low safety focus singles) *M* (*SE*)	Overall comparison
Satisfaction with singlehood	**0.44 (0.07)$_a$**	−0.38 (0.07)$_b$	−0.13 (0.06)$_c$	$\chi^2 = 73.40$, $p < .001$
Life satisfaction	−0.12 (0.07)$_a$	−0.07 (0.07)$_b$	**0.17 (0.06)$_c$**	$\chi^2 = 8.30$, $p = .02$
Ambivalence toward singlehood	−0.43 (0.06)$_a$	**0.32 (0.07)$_b$**	**0.16 (0.07)$_b$**	$\chi^2 = 61.29$, $p < .001$
Positivity toward singlehood	**0.39 (0.06)$_a$**	−0.16 (0.08)$_b$	−0.25 (0.07)$_b$	$\chi^2 = 56.10$, $p < .001$
Negativity toward singlehood	−0.46 (0.06)$_a$	**0.45 (0.07)$_b$**	0.09 (0.07)$_c$	$\chi^2 = 94.30$, $p < .001$
Desire to date in the near future	−0.77 (0.05)$_a$	**0.58 (0.07)$_b$**	0.28 (0.06)$_c$	$\chi^2 = 308.01$, $p < .001$
Desire to date someday	−0.72 (0.06)$_a$	**0.53 (0.06)$_b$**	0.28 (0.06)$_c$	$\chi^2 = 220.67$, $p < .001$
Desire to (re)marry in the near future	−0.44 (0.04)$_a$	**0.34 (0.09)$_b$**	**0.16 (0.07)$_b$**	$\chi^2 = 94.45$, $p < .001$
Desire to (re)marry someday	−0.56 (0.05)$_a$	**0.49 (0.08)$_b$**	0.16 (0.07)$_c$	$\chi^2 = 153.12$, $p < .001$
Desire to have a(nother) child in the near future	−0.32 (0.05)$_a$	**0.26 (0.09)$_b$**	**0.11 (0.07)$_b$**	$\chi^2 = 47.30$, $p < .001$
Desire to have a(nother) child someday	−0.49 (0.04)$_a$	**0.50 (0.08)$_b$**	0.08 (0.07)$_c$	$\chi^2 = 133.82$, $p < .001$
% of time spent alone (vs. with others)	**0.39 (0.06)$_a$**	−0.26 (0.07)$_b$	−0.18 (0.07)$_b$	$\chi^2 = 56.85$, $p < .001$
% of social time with family	**0.34 (0.07)$_a$**	−0.15 (0.07)$_b$	−0.21 (0.06)$_b$	$\chi^2 = 34.17$, $p < .001$
% of social time with friends	−0.14 (0.07)$_a$	0.06 (0.07)$_a$	0.09 (0.06)$_a$	$\chi^2 = 5.80$, $p = .06$
% of social time with people with professional rel.	−0.22 (0.06)$_a$	**0.09 (0.07)$_b$**	**0.14 (0.07)$_b$**	$\chi^2 = 16.93$, $p < .001$
% of social time with potential romantic partners	−0.28 (0.05)$_a$	**0.10 (0.08)$_b$**	**0.19 (0.08)$_b$**	$\chi^2 = 34.53$, $p < .001$
% of social time with potential sexual partners	−0.20 (0.06)$_a$	**0.09 (0.07)$_b$**	**0.12 (0.07)$_b$**	$\chi^2 = 14.29$, $p < .001$
% of social time with others	**0.19 (0.09)$_a$**	−0.07 (0.05)$_b$	−0.13 (0.05)$_c$	$\chi^2 = 8.14$, $p = .02$

Note. *SE* = standard error; rel. = relationship. Different subscripts indicate significant differences at $p = .05$, correcting for the false discovery rate. Profile(s) with the highest score is bolded. Variables were standardized to help interpret the size of the difference; please see the Supplemental Material for the results with raw scores.

(primarily) European and American cultural contexts. In Study 3, we sought to examine if and how the motivational configurations differ in another culture, East Asia. South Korea was chosen for a practical reason (i.e., available funding), but it is one of the countries commonly studied to represent East Asian culture and to be contrasted with "Western" cultures (e.g., Cuddy et al., 2015; Park et al., 2015; Wang et al., 2022). While some previous work has examined cultural similarities and differences in social motives (Cook et al., 2021), it is unknown whether a similar pattern of social motives will be observed among single individuals in Korean as in the European/American cultural contexts, thus we did not make any predictions.

Method

Participants and Procedure

Data for this study were collected in May and June 2021. This was when about one third of the entire Korean population had received at least one dose of a COVID-19 vaccine. The number of confirmed cases was still on the rise, and strong social distancing measures were in place (e.g., four-person limit on private social gatherings, early closing of restaurants and cafes; Shin, 2021). As in Studies 1 and 2, we aimed to recruit a sufficiently large sample of single individuals ($n = 1{,}000$), relatively equally distributed across gender (men and women) and four age groups (the 20s, 30s, 40s, and 50s). Participants were recruited online through Gallup Korea. Participants needed to be Korean, have resided in Korea for more than 80% of their lives, and not be currently involved in a romantic relationship. Participants who met the age criteria and were not married received an invitation to the survey via email or text messages and were further screened based on their responses to filter questions (i.e., residence history and current relationship status). After individuals who failed attention checks were excluded, data from 1,036 participants were available for analysis.

The sample consisted of 503 men and 533 women who were on average 38.90 years old ($SD = 10.88$; range = 20–59). Ninety percent of the participants ($n = 933$) identified as heterosexual, 26 as bisexual, 12 as gay/lesbian, three as queer, and 62 reported questioning or not wanting to respond. The majority of the participants were never married ($n = 969$), with some divorced ($n = 54$), or widowed ($n = 13$).

Measures: Profile Indicators

Fundamental Social Motives. We used the FMI as in previous studies (translated into Korean; Ko et al., 2020) to assess social motives. The internal consistencies of the subscales were as follows: self-protection ($\alpha = .89$), disease avoidance ($\alpha = .84$), affiliation—group ($\alpha = .82$), affiliation—exclusion concern ($\alpha = .90$), affiliation—independence ($\alpha = .88$), status ($\alpha = .92$), mate seeking ($\alpha = .92$), and kin care—family ($\alpha = .92$).

Measures: Outcomes

The following outcomes were assessed the same way as in Study 2: life satisfaction ($\alpha = .89$), satisfaction with being single ($\alpha = .90$), ambivalence toward singlehood ($\alpha = .79$), desire for relationship (six separate items), time spent alone (vs. with others) and for all but 42 participants who indicated spending at least 1% of their free time with others, time spent with different interaction partners. Correlations among all study variables can be found in the Supplemental Material.

Results

The fit statistics for one- to eight-profile solutions from the LPA are summarized in Table 6. BIC and CAIC values reached the lowest points at seven- and six-profile solutions, respectively, while AIC and SABIC continued to decrease. BLRT continued to favor a more complex model as well. However, as adding more than three profiles resulted in creating a profile consisting of a fairly small percentage of participants (<8%; see Table 6), we decided to retain the three-solution profile. Average probabilities for the most likely profile membership varied from .85 to .89.

Profile Descriptions

The first profile which consisted of 37% of the sample was similar to the *independent singles* profile found in Studies 1 and 2, with a markedly high independence motive and lower levels of motives for group belonging, exclusion concern, status, mate seeking, or kin care. The second profile, which included 36% of the sample, was characterized by low independence motives combined with high levels of all other motives, as in the *socially focused singles* profile in previous studies. Last, the third profile which included 27% of the sample was similar to the *low safety focus singles* in previous studies with their low self-protection, disease avoidance, as well as independence motives. However, unlike the previous studies in which mate seeking and kin care motives were at average for this profile, here this profile was characterized by high levels of mate seeking and low levels of kin care motives.

Links With Predictors

As shown in Table 7, only gender emerged as a significant correlate such that, as in Studies 1 and 2, women were more likely to belong to the *independent singles* or *socially focused* singles profiles than *low safety focus* singles. No significant association was found with age, dating history, or marital history.

Links With Outcomes

Table 8 summarizes results from testing mean differences in important outcomes across profiles. Overall, there were striking similarities between Tables 5 and 8 (although of course, the profiles are not identical). Those in the *independent singles profile* appeared to be the most satisfied with their single life, felt the least ambivalence toward it, but also felt least satisfied with their life overall. They also had the least desire to date, marry, or have a child both in the near and distant future. They spent the most time by themselves and when they spent time with others, they allocated more time to their family and less to potential romantic or sexual partners than did those in the other profiles.

Those in the *socially focused singles* profile did not differ from those in the *low safety focus singles* profile in terms of satisfaction with singlehood or life overall, but they appeared to have greater desire to date both in the near and distant future and to marry someday. They also spent less time alone compared to those in the *low safety focus singles*.

Study 4

Across studies, we identified three subgroups of single individuals with distinct patterns of fundamental social motives. However, it is important to note that all the reported data were collected after the onset of the COVID-19 pandemic, which arguably could have affected people's motivational priorities (Neel et al., 2020). This raises the question of how generalizable the findings may be to single individuals in the prepandemic period. As an attempt to (partially) address this question, we conducted a secondary analysis of data that had been collected before the pandemic. This sample is more similar to the samples in Studies 1 and 2 than Study 3 in terms of the cultural background, but nevertheless differs from all three samples in several ways (e.g., age distribution).

Method

Participants and Procedure

Analyses for this study were based on data from previous research (see detailed description of the samples A, B, and C in Neel et al., 2016). Data collection took place between 2012 and 2015. Participants were recruited from MTurk and only those who reported not currently being in a relationship (n = 348) were included in our analyses. In two of the samples, participants were required to have a human intelligence task approval rate of >85% (this information is unavailable for the third sample). Participants (159 male, 189 female) were 32.30 years old on average (SD = 12.97; range = 18–82) and reported their ethnicity as follows: 254 White, 44 Black or African American, 34 Asian or Asian American, 22 Hispanic or Latino, four American Indian or Alaska Native, four Native

Table 6
Fit Indices for LPA Models (Study 3)

Profile estimated	LL	AIC	BIC	CAIC	SABIC	Entropy	LMR p value	BLRT p value	Smallest n%
One profile	−11381.36	22794.72	22873.81	22889.81	22822.99				
Two profiles	−11050.17	22166.34	22329.46	22362.46	22224.65	0.65	.002	<.001	39%
Three profiles	**−10734.83**	**21569.67**	**21816.83**	**21866.83**	**21658.02**	**0.72**	**<.001**	**<.001**	**27%**
Four profiles	−10579.52	21293.03	21624.22	21691.22	21411.42	0.76	.001	<.001	7%
Five profiles	−10460.86	21089.73	21504.95	21588.95	21238.15	0.76	.35	<.001	7%
Six profiles	−10379.35	20960.70	21459.96	21560.96	21139.17	0.76	.61	<.001	7%
Seven profiles	−10317.67	20871.33	21454.62	21572.62	21079.84	0.76	.24	<.001	5%
Eight profiles	−10263.53	20797.06	21464.38	21599.38	21035.60	0.76	.42	<.001	7%

Note. LPA = latent profile analyses; LL = model log likelihood; AIC = Akaike information criterion; BIC = Bayesian information criterion; CAIC = consistent AIC; SABIC = sample size–adjusted BIC; LMR = adjusted Lo, Mendell, and Rubin likelihood ratio test; BLRT = bootstrapped likelihood ratio test. The solution considered to be optimal is bolded.

Table 7
Results From Multinomial Logistic Regressions (Study 3)

Variable	Profile 1 versus Profile 2 (independent vs. socially focused singles)		Profile 1 versus Profile 3 (independent vs. low safety focus singles)		Profile 2 versus Profile 3 (socially focused vs. low safety focus singles)	
	Coefficient (*SE*)	*OR* [95% CI]	Coefficient (*SE*)	*OR* [95% CI]	Coefficient (*SE*)	*OR* [95% CI]
Gender (woman)	0.15 (0.26)	1.17 [0.70, 1.95]	0.94 (0.33)**	2.56 [1.35, 4.86]	0.79 (0.35)*	2.20 [1.10, 4.40]
Age	0.02 (0.01)	1.02 [1.00, 1.03]	0.02 (0.01)	1.02 [1.00, 1.04]	0.00 (0.01)	1.00 [0.98, 1.02]
Relationship history (ever dated)	0.58 (0.43)	1.79 [0.77, 4.16]	−0.18 (0.47)	0.84 [0.34, 2.09]	−0.76 (0.60)	0.47 [0.15, 1.51]
Marital history (ever married)	−0.60 (0.37)	0.55 [0.27, 1.12]	0.10 (0.49)	1.11 [0.42, 2.88]	0.70 (0.47)	2.02 [0.80, 5.09]

Note. The coefficients and *OR*s reflect the effect of the predictor on the likelihood of membership into the first listed profile relative to the second listed profile. *SE* = standard error; CI = confidence interval.
* $p < .05$. ** $p < .01$.

Hawaiian or other Pacific Islander, and seven other or unidentified (multiple responses allowed).

Measures

The internal consistencies of the FMI subscales were as follows: self-protection (α = .90), disease avoidance (α = .88), affiliation—group (α = .81), affiliation—exclusion concern (α = .90), affiliation—independence (α = .87), status (α = .79), mate seeking (α = .92), and kin care—family (α = .92).

Results

As in previous studies, we estimated one- to eight-profile solutions using factor scores from the ESEM. Although the results (Table 9) indicated that BIC reached a minimum at the four-profile solution, as the smallest profile comprised only 6% ($n = 21$) of the participants, we also examined the three-profile solution. The addition of the fourth profile seemed to only add a less interpretable profile to the existing three profiles, thus the three-profile solution was selected.

Profile Descriptions

Profile 1, which resembled the *independent singles* profile in previous studies, was characterized by high levels of independence motive, average levels of self-protection, disease avoidance, and kin care motive, and low levels of all other motives. Profile 2, similar to *socially focused singles* in previous studies, was characterized by low levels of independence and high levels of all other motives, but

Table 8
Associations Between Profile Membership and the Key Outcomes (Study 3)

Variable	Profile 1 (independent singles) *M* (*SE*)	Profile 2 (socially focused singles) *M* (*SE*)	Profile 3 (low safety focus singles) *M* (*SE*)	Overall comparison
Satisfaction with singlehood	**0.19 (0.06)$_a$**	−0.08 (0.05)$_b$	−0.14 (0.06)$_b$	$\chi^2 = 14.29$, $p = .001$
Life satisfaction	−0.14 (0.06)$_a$	**0.10 (0.07)$_b$**	**0.07 (0.05)$_b$**	$\chi^2 = 8.17$, $p = .02$
Ambivalence toward singlehood	−0.28 (0.06)$_a$	−0.01 (0.06)$_b$	**0.39 (0.07)$_c$**	$\chi^2 = 54.55$, $p < .001$
Positivity toward singlehood	**0.24 (0.06)$_a$**	0.03 (0.06)$_b$	−0.36 (0.06)$_c$	$\chi^2 = 51.23$, $p < .001$
Negativity toward singlehood	−0.27 (0.06)$_a$	**0.18 (0.06)$_b$**	**0.12 (0.06)$_b$**	$\chi^2 = 29.40$, $p < .001$
Desire to date in the near future	−0.47 (0.06)$_a$	**0.41 (0.06)$_b$**	0.10 (0.05)$_c$	$\chi^2 = 99.50$, $p < .001$
Desire to date someday	−0.42 (0.06)$_a$	**0.39 (0.06)$_b$**	0.06 (0.05)$_c$	$\chi^2 = 79.97$, $p < .001$
Desire to (re)marry in the near future	−0.41 (0.05)$_a$	**0.27 (0.07)$_b$**	**0.21 (0.06)$_b$**	$\chi^2 = 79.20$, $p < .001$
Desire to (re)marry someday	−0.41 (0.06)$_a$	**0.33 (0.06)$_b$**	0.12 (0.06)$_c$	$\chi^2 = 77.35$, $p < .001$
Desire to have a(nother) child in the near future	−0.34 (0.05)$_a$	**0.15 (0.07)$_b$**	**0.26 (0.06)$_b$**	$\chi^2 = 58.42$, $p < .001$
Desire to have a(nother) child someday	−0.36 (0.05)$_a$	**0.23 (0.07)$_b$**	**0.18 (0.06)$_b$**	$\chi^2 = 60.05$, $p < .001$
% of time spent alone (vs. with others)	**0.34 (0.05)$_a$**	−0.32 (0.07)$_b$	−0.03 (0.06)$_c$	$\chi^2 = 55.56$, $p < .001$
% of social time with family	**0.17 (0.07)$_a$**	−0.13 (0.06)$_b$	−0.05 (0.07)$_b$	$\chi^2 = 11.45$, $p = .003$
% of social time with friends	−0.04 (0.07)$_a$	−0.00 (0.06)$_a$	0.06 (0.07)$_a$	$\chi^2 = 1.16$, $p = .56$
% of social time with people with professional rel.	−0.10 (0.06)$_a$	0.10 (0.06)$_a$	−0.00 (0.07)$_a$	$\chi^2 = 4.70$, $p = .10$
% of social time with potential romantic partners	−0.15 (0.05)$_a$	**0.15 (0.07)$_b$**	−0.00 (0.06)$_{ab}$	$\chi^2 = 10.77$, $p = .005$
% of social time with potential sexual partners	−0.13 (0.04)$_a$	**0.08 (0.07)$_b$**	**0.07 (0.08)$_b$**	$\chi^2 = 8.50$, $p = .01$
% of social time with others	−0.00 (0.06)$_a$	0.02 (0.06)$_a$	−0.03 (0.07)$_a$	$\chi^2 = 0.23$, $p = .89$

Note. *SE* = standard error; rel. = relationship. Different subscripts indicate significant differences at α = .05, correcting for the false discovery rate. Profile(s) with the highest score is bolded. Variables were standardized to help interpret the size of the difference; please see the Supplemental Material for the results with raw scores.

Table 9
Fit Indices for LPA Models (Study 4)

Profile estimated	LL	AIC	BIC	CAIC	SABIC	Entropy	LMR *p* value	BLRT *p* value	Smallest *n*%
One profile	−3806.54	7645.08	7706.71	7722.71	7655.96				
Two profiles	−3674.69	7415.37	7542.49	7575.49	7437.81	0.68	<.001	<.001	47%
Three profiles	**−3604.33**	**7308.65**	**7501.26**	**7551.26**	**7342.65**	**0.79**	**.27**	**<.001**	**11%**
Four profiles	−3542.64	7219.28	7477.38	7544.38	7264.84	0.84	.25	<.001	6%
Five profiles	−3507.69	7183.38	7506.97	7590.97	7240.49	0.82	.25	.02	6%
Six profiles	−3464.75	7131.50	7520.57	7621.57	7200.17	0.83	.60	.01	6%
Seven profiles	−3428.84	7093.69	7548.25	7666.24	7173.91	0.81	.76	.53	6%
Eight profiles	−3391.45	7052.89	7572.94	7707.94	7144.68	0.88	.74	.27	1%

Note. LPA = latent profile analyses; LL = model log likelihood; AIC = Akaike information criterion; BIC = Bayesian information criterion; CAIC = consistent AIC; SABIC = sample size–adjusted BIC; LMR = adjusted Lo, Mendell, and Rubin likelihood ratio test; BLRT = bootstrapped likelihood ratio test. The solution considered to be optimal is bolded.

average levels of self-protection and disease avoidance motives. Last, Profile 3 was characterized by low levels of group, independence, and kin care motives, and average levels of all other motives.

Overall, we found a somewhat similar pattern of profiles corresponding to the *independent singles* and *socially focused singles* profiles in previous studies. However, perhaps reflecting the critical difference in temporal context, disease avoidance was not a distinguishing feature across the three profiles in this study. That is, whereas the profiles clearly differed in the degree of disease avoidance motive in samples recruited during the pandemic (e.g., see Figure 1), all three profiles were characterized by average levels of disease avoidance in this prepandemic sample. Further, the proportion of this iteration of the *independent singles* group (i.e., Profile 1) was much higher such that more than half of the entire sample belonged to this group. In contrast, there were few participants belonging to this iteration of the *socially focused singles* group (i.e., Profile 2). Finally, the third group (previously labeled as *low safety focus singles*) in the present study showed low levels of group affiliation and kin care motives, combined with low levels of independence motive. Although this combination of low interest in both group (or kin) affiliation and independence may seem puzzling, it is possible that their desire for connection manifests through their motivation to acquire high status or a romantic partner, which were indeed relatively high. Nevertheless, it should be noted that this analysis was based on a smaller and younger sample (more than half of the sample were in their 20s or younger) compared to the previous samples we collected.

Links With Predictors

When we examined whether gender and age were related to the profile membership as in previous studies, women were less likely to belong to Profile 3 than Profile 1 ($b = 1.33$, $SE = 0.46$, $p = .004$) or Profile 2 ($b = 0.97$, $SE = 0.47$, $p = .04$). Older individuals were more likely to belong to Profile 1 than Profile 2 ($b = 0.06$, $SE = 0.01$, $p < .001$) or Profile 3 ($b = 0.06$, $SE = 0.02$, $p = .004$). Thus, to the extent that three profiles partly map onto the *independent*, *socially focused*, and *low safety focus singles* profiles in Studies 1 and 2, these results are similar to the patterns observed in those studies.

General Discussion

The goal of this research was to identify groups of single individuals with distinct profiles of social motives. Across two samples that consisted primarily of European and American participants and one Korean sample, we identified three groups of singles with relatively consistent motivational patterns: (a) singles with strong independence motives and less interest in affiliation, status, or mating (i.e., independent profile); (b) singles with great interest in self-protection as well as social connections and status (i.e., socially focused profile); and (c) singles with relatively little interest in self-protection but moderate interest in affiliation (i.e., low safety focus profile). Notably, despite replicating the defining features of each profile, the equivalent to low safety focus singles in the Korean sample was also characterized by relatively high mating and low kin care motives. To complement our analyses of the three samples that were all collected during the COVID-19 pandemic, we also analyzed a smaller sample collected before the pandemic. Highlighting the importance of considering the historical background (although notably, this sample differed from the others in multiple ways), while we found support for a three-profile solution, some considerable differences in the specific patterns of motives emerged, including less of a differentiating role for disease avoidance motive across profiles.

The present research is unique in that it used a person-centered approach to uncover different configurations of motivational profiles that may be useful in representing the single population. By replicating similar patterns of motivational profiles across samples, this work provides empirical support for the notion of meaningful within-group variability among singles. Further, the nature of each profile helps extend our knowledge of constellations of single individuals' motivations. In particular, by relying on an array of social motivations rather than focusing on one motivation (e.g., centered around romantic interest; Beckmeyer & Cromwell, 2019), it was possible to obtain more nuanced insights into singles' social motivations. For example, the data distinguished singles who pursued relational connections across different social domains (i.e., socially focused singles) from those for whom such pursuit was focused more specifically on belonging to groups and/or seeking potential romantic partners (i.e., low safety focus singles). Overall, exploring multiple coexisting social motivations among single individuals allowed for a more comprehensive understanding of what different types of single individuals want in their social lives. As we discuss in detail below, both the nature of the three motivational profiles and their differences in outcomes such as satisfaction with singlehood have practical and theoretical implications.

Independent Singles

Despite the stereotypes that singles must be dissatisfied with the state of being single (Greitemeyer, 2009), the present findings suggest that there is a decent proportion of single individuals who value independence and are not strongly motivated to change their status. These individuals seem to have relatively little drive to affiliate with others, seek high status, find a partner, or care for their family. Such emphasis on independence has indeed been noted in existing work on singlehood. For example, in describing why they became (remained) single, older singles in Band-Winterstein and Manchik-Rimon (2014) research described their desire to maintain an independent lifestyle without having to adjust to another person's needs; Simpson (2016) also identified enjoying doing activities alone or preferring to live alone as a prevalent theme in single women's narratives.

Our data suggest that this group of individuals may typically be older (Studies 1 and 2), which aligns with previous findings that older (vs. younger) singles tend to have more positive attitudes toward singlehood (Park et al., 2022; Poortman & Liefbroer, 2010). It is possible that those who value independence to a greater degree are more likely to remain single, or alternatively, being (becoming) single at an older age leads one to place greater value on independence. For example, to the extent that older individuals minimize investing efforts into realizing a less attainable goal such as acquiring a partner (Heckhausen, 1997; Wrosch & Heckhausen, 1999), they may be more motivated to value the independence that they do have (e.g., Laurin et al., 2013). This way, this group of singles also seems to closely map on to those considered to be "single by choice" (Hostetler, 2009) or who self-report that they are voluntarily single (Adamczyk, 2017). Presumably, those with greater focus on maintaining independence would be the ones who feel more autonomous in their decision to stay out of a highly interdependent relationship.

In fact, some theoretical perspectives attributing the rise in the single population to increasing societal value on independence may expect such an emphasis on independence from the single population as a whole. Within the framework of second demographic transition (SDT; Lesthaeghe, 2010), demographic trends indicative of weakening of marriage (e.g., rise in divorce, diversified living arrangements) are linked with value changes such as greater focus on individuality or autonomy. Findings such as an upward trend in the belief that one can be happy without a romantic partner support this idea (Scheling & Richter, 2021). Nevertheless, as the concept of SDT was proposed primarily in response to changes in Europe, the universality of the framework has been debated (Raymo et al., 2015). While the present data do not stand to directly support or challenge SDT, they do seem to suggest that there is a substantial population of singles in at least one other industrialized culture (i.e., Korea) who are relatively high in their desire to be independent.

An important aspect of the independent singles group was that despite their high satisfaction with single status, they were either equally or less satisfied with their lives overall compared to the other groups across studies. This divergence raises the question of what, if not dissatisfaction with relationship status (Lehmann et al., 2015), might account for their lower life satisfaction. One candidate the present data seem to suggest is this group's lack of social interactions. Research robustly indicates that time spent interacting with others is positively associated with life satisfaction or overall happiness (Milek et al., 2018; Sun et al., 2020), whereas time spent alone is negatively associated with life satisfaction, even accounting for personality traits such as extraversion. Thus, it might be the case that these independent singles' prioritization of independence over connecting with their friends, family, or potential romantic partners comes at the cost of missed opportunities for better well-being. In fact, preference for independence, even in healthy forms such as solitude, may develop into a source of poor well-being over the long term, if not concurrently. That is, given that preference for solitude tends to lead to others pulling away (Ren & Evans, 2021), independence may promote short-term solitude gains but long-term social disconnection.

Thus, one promising avenue for future research may be to find the best way to help independently oriented individuals remain socially connected while also creating space for their independence and solitude. Although there is no direct evidence that this group of singles will find social experiences as pleasant as others, research on attachment avoidance speaks to the potential value of promoting more social integration. That is, we found some evidence that this group of singles was characterized by relatively high levels of attachment avoidance, and individuals high in attachment avoidance have been found to benefit from socially intimate experiences, especially if they are tailored to their needs for autonomy (e.g., invisible support; Girme et al., 2019). Considering that this group of single individuals may not have a strong initiative to invest a great deal of time and energy into relationship initiation or maintenance, it might be practically informative to explore if there are less effortful strategies (e.g., virtual interactions; Kafetsios et al., 2017) to maintain connections that promote social reward for these individuals.

Of course, despite the evidence for their high levels of attachment avoidance (Study 1), this group of individuals should not be equated with the so-called "avoidantly attached individuals" as there are ways in which the two groups seem to differ. For example, previous work has shown that attachment avoidance has a small or negligible negative association with satisfaction with singlehood (MacDonald & Park, 2022), whereas the independent singles in the current research seem to feel relatively satisfied with singlehood. Independent singles were also relatively older, contrasting the finding that attachment avoidance tends to be lower at an older age (Chopik et al., 2013). Thus, whether independent singles would benefit from positive relationship experiences in the same manner as avoidantly attached individuals, and whether similar strategies to make the experiences more pleasant for avoidantly attached individuals would work for independent singles are open questions.

Socially Focused Singles

In contrast to those in the independent singles group, singles belonging to the socially focused singles group seemed to devalue independence and felt the most negative about their single status. While these individuals had the greatest desire to change their relationship status, their profile overall seemed to suggest that finding a romantic partner was not their only or even most important goal. Rather, these singles were just as, if not more, motivated to affiliate with their family and group members as well as get recognition from others, goals that perhaps stemmed from their concerns about exclusion. In short, these singles' pursuit of connection tended to be nonselective in terms of targets. This seems to align with the data showing relatively high levels of attachment anxiety in this group (Study 1). Individuals high in attachment anxiety have strong needs for love and closeness with others (Mikulincer & Shaver, 2016) and

thus tend to adopt more intense approach goals in their relationships (Locke, 2008) and initiate more social ties (although they may have difficulty successfully maintaining them; Gillath et al., 2019). They also tend to have greater desire for a romantic partner and feel less satisfied with being single (MacDonald & Park, 2022). Similar to highly anxiously attached individuals, individuals belonging to the socially focused singles group seemed to be in consistent pursuit of closeness with others including (but by no means limited to) a potential romantic partner and feel relatively negatively about being single.

By examining an array of social motives, however, the present research also provided unique insights that go beyond what attachment perspectives have offered. Specifically, the data suggested that singles in this group also tend to have strong motivation to protect themselves from harm and disease, which, in combination with their desire to connect with others, can create an internal conflict. Especially during the pandemic, physically contacting other individuals naturally poses a threat to one's safety. Perhaps it is in light of such struggles pursuing somewhat incompatible goals that these singles come to feel more negatively about being single. Not having a romantic partner may be an easily accessible reason for not having a safe source of intimacy (which may be true at least during the pandemic; van Tilburg, 2022).

However, it is left open whether these singles will feel more satisfied with their relationship status and life overall if they achieve the goal of securing a romantic partner. To the extent that their dissatisfaction with relationship status is less about being single than about their global anxiety, it is possible that without having their concern about exclusion, or more broadly, about their relational value fully addressed, this group of singles may not be any more satisfied even if they do find themselves in the romantic relationship they crave. Thus, how effectively these individuals come to manage multiple social motives (i.e., pursue one without worrying about having another unmet) may be more important than whether they remain single or become partnered when it comes to boosting their overall well-being. Future research is needed to empirically test these predictions which are based on post hoc interpretations of the data.

Low Safety Focus Singles

A key feature of the low safety focus singles profile was relatively low motivation to protect oneself from harm or disease. Further, individuals in this group were low in independence motives similar to those in the socially focused singles profile, but importantly, they were not concerned about exclusion while seeking affiliation (as were the socially focused singles). In line with Neel et al. (2016) finding that women tend to be more concerned about protecting themselves from dangers others may pose and less about finding a partner, women were consistently less likely to belong to this group than to the other two groups across the studies.

In terms of how these individuals fare in singlehood, the findings were somewhat inconsistent; they evidenced more satisfaction with being single and life overall than socially focused singles in one study (Study 2) but evidenced no differences in others (Studies 1 and 3). It is possible that a clearer difference between the low safety focus and socially focused groups may emerge when their relationship status changes. In contrast to the socially focused singles, low safety focus singles' pursuits for affiliation were not tainted with exclusion concern nor did they seem to experience internal conflict between self-protective and affiliative motives. To the extent that a primary barrier to their overall well-being is dissatisfaction with single status, these individuals may perhaps be happier when they enter a relationship. These speculative ideas will need to be tested longitudinally, and in doing so, the replicability of this profile in the absence of the pandemic should also be confirmed. Indeed, there was little support for a profile equivalent to the low safety singles in the one prepandemic sample (Study 4) we analyzed.

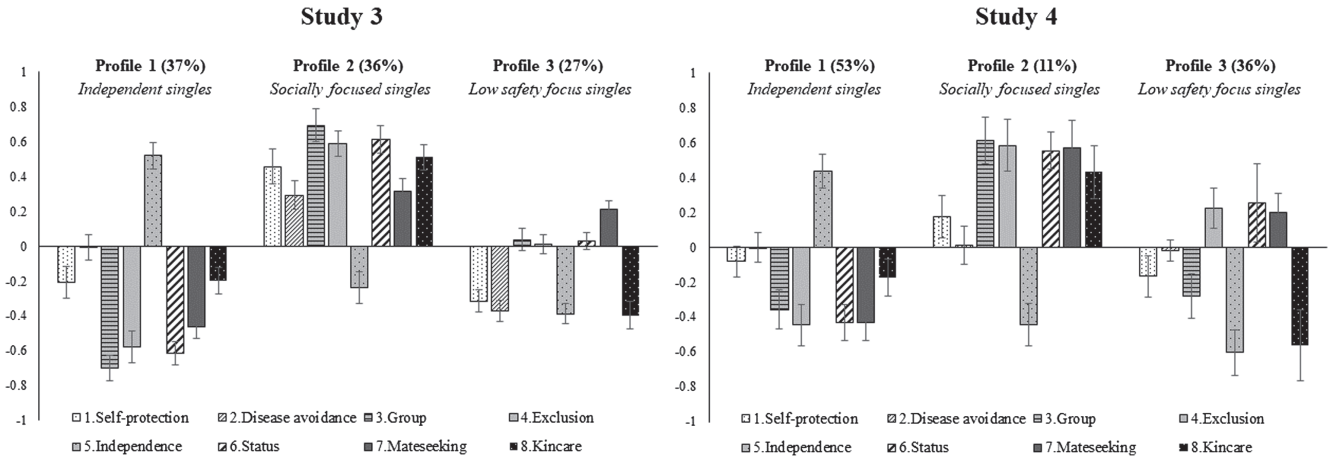
Limitations and Conclusions

The present results need to be interpreted with constraints on generalizability in mind. While we ensured that each sample (in Studies 1, 2, and 3) included a relatively equal number of men and women distributed across a broad range of ages, there are ways in which these samples were not representative of singles generally. For one, these samples consisted of single individuals who decided to participate in an online study, and one advertised as being about singlehood. This recruitment strategy could have selectively excluded singles with certain characteristics (e.g., those who are extremely dissatisfied with being single). Further, although we tried to test the cultural generalizability of the profiles by recruiting samples from two different platforms (one primarily used by European and American participants and another exclusively recruiting Koreans), they are still similarly only representative of singles in industrialized countries. Moreover, when conceptualizing the samples very broadly as representing singles from Western (Studies 1, 2, and 4) and Eastern (Study 3) cultures, there was a more limited variability within the "Eastern singles" (i.e., consisting only of Koreans), which should be noted. Finally, as we did not assess whether our participants had children in Studies 1 and 3, we cannot be certain whether our samples included a representative proportion of single parents. In fact, among single parents, the parental care subscale which we did not include in our study for the sake of generalizability might be an essential motive in characterizing different configurations of motivational profiles. As such, future research may want to directly explore what classes of singles emerge from samples specifically of single parents (e.g., would we still observe an independence-oriented profile?) and/or if inclusion of the parental care subscale can affect the motivational patterns we find.

As highlighted multiple times throughout the article, the unique historical context of our studies is another important factor that constrains the generalizability of our findings. Specifically, three out of the four samples we analyzed were collected after the onset of the pandemic, a strong situational force that could have affected both the participants' social motives and their feelings about being single. Although some tentative evidence was found in Study 4 that there may have been prepandemic groups of singles with similar motivation profiles observed in the other studies (i.e., independent and socially focused singles), this analysis was based on a relatively small sample which differed from the samples in Studies 1–3 in important ways (e.g., age distribution), and the links between profiles and other outcomes were not examined. Further, despite some similarities, there were certainly ways in which the profiles in Study 4 differed from those in Studies 1–3. One notable difference was the role of disease avoidance, which varied to a great degree in the prepandemic samples but was not a distinguishing factor in the samples collected during the pandemic (see Figure 2). On the one hand, this supports the validity of our findings and the benefit of taking a multimotive

Figure 2

The Mean Levels of the Motives Across the Profiles in Study 3 (Left) and Study 4 (Right)



Note. Profile indicators are estimated from factor scores with a mean of 0 and a standard deviation of 1. Error bars indicate standard errors. The labels in italics have been included to facilitate interpretations across the studies.

approach; on the other hand, it further highlights the need to interpret our results within the historical–cultural context, which can differently activate and deactivate certain motives. Thus, while revisiting the motivational profiles when there is no longer a strong disease threat might be important, a perfect replication is perhaps unlikely and unreasonable to expect. Further, as the (hopeful) waning of the pandemic indicates a transition into a new historical period rather than a return to prepandemic life (given potentially lasting changes and societal adaptations; e.g., Amis & Greenwood, 2021), such data will also be unable to speak to prepandemic groupings of singles.

In future research, the predictive utility of the profiles should also be tested using longitudinal data. While the present data showed robust evidence that singles belonging to different profiles meaningfully differ in concurrent feelings and desires, examining whether profile membership can predict future outcomes such as changes in well-being or relationship status will further reinforce the value of the latent profile approach. When it comes to predicting behavioral outcomes, collecting experience sampling data could be particularly useful as such data can help address potential memory bias in self-reported behaviors and capture real time experiences in full. That is, experience sampling methodology would allow researchers to capture how singles with different motivational profiles spend time in their daily lives and how daily activities in turn relate to their well-being. In particular, given that singles in general reported spending more time by themselves than with others (in both Studies 2 and 3), it would be of interest to explore in depth how singles spend their nonsocial lives. Such knowledge can inform us of practical strategies singles can adopt to boost their well-being. For example, it might be the case that there are activities that do not require company or are better enjoyed alone (e.g., reading, climbing, playing video games) that might be particularly helpful in enriching singles' lives. Alternatively, researchers can also build on previous work activating a social motive (e.g., Brown et al., 2019; Maner et al., 2005) to activate multiple motives and experimentally examine the joint effects of activated motivations on singles' social behaviors. For example, activating mate-seeking motivation (watching a romantic film; Maner et al., 2005) with or without a disease avoidance prime (e.g., a coughing experimenter) may have meaningfully different effects on singles' immediate motivations to (not) engage in social activities.

In conclusion, the present research advances the growing body of research on singlehood by offering new theoretical perspectives on different types of singles and contributing empirical evidence for the idea that not all singles are the same. While there are singles who greatly value their independence, there are singles who somewhat anxiously seek connections from others, and singles (at least during the pandemic) who are seeking romance and/or affiliation with relatively little regard to exclusion concern or self-protection. Recognizing the diversity of the single population at the societal level may have practical implications for reducing stereotyping (e.g., Crawford et al., 2002) and for policy making (e.g., in the workplace; Casper & DePaulo, 2012). Moreover, that these different types of singles differ in how satisfied they are with being single, with their lives, as well as how they spend their time suggest that insights into single individuals' patterns of social motivations can be informative in understanding, and possibly predicting and promoting, single individuals' well-being. Overall, we believe that the present findings extend our understanding of single individuals and stimulate further research that goes beyond descriptive and exploratory purposes.

References

Adamczyk, K. (2017). Voluntary and involuntary singlehood and young adults' mental health: An investigation of mediating role of romantic loneliness. *Current Psychology*, *36*(4), 888–904. https://doi.org/10.1007/s12144-016-9478-3

Adamczyk, K. (2018). Direct and indirect effects of relationship status through unmet need to belong and fear of being single on young adults' romantic loneliness. *Personality and Individual Differences*, *124*, 124–129. https://doi.org/10.1016/j.paid.2017.12.011

Adamczyk, K. (2021). Current and future paths in research on singlehood. In R. J. Coplan, J. C. Bowker, & L. J. Nelson (Eds.), *The handbook of solitude: Psychological perspectives on social isolation, social*

withdrawal, and being alone (2nd ed., pp. 163–177). Wiley-Blackwell. https://doi.org/10.1002/9781119576457.ch12

Amis, J., & Greenwood, R. (2021). Organisational change in a (post-) pandemic world: Rediscovering interests and values. *Journal of Management Studies*, *58*(2), 582–586. https://doi.org/10.1111/joms.12663

Asparouhov, T., & Muthén, B. (2014). *Auxiliary variables in mixture modeling: Using the BCH method in Mplus to estimate a distal outcome model and an arbitrary secondary model* (Mplus Web Note: No. 21 Version 2). http://www.statmodel.com/download/asparouhov_muthen_2014.pdf

Bakk, Z., Tekle, F. B., & Vermunt, J. K. (2013). Estimating the association between latent class membership and external variables using bias-adjusted three-step approaches. *Sociological Methodology*, *43*(1), 272–311. https://doi.org/10.1177/0081175012470644

Band-Winterstein, T., & Manchik-Rimon, C. (2014). The experience of being an old never-married single: A life course perspective. *International Journal of Aging & Human Development*, *78*(4), 379–401. https://doi.org/10.2190/AG.78.4.d

Beckmeyer, J. J., & Cromwell, S. (2019). Romantic relationship status and emerging adult well-being: Accounting for romantic relationship interest. *Emerging Adulthood*, *7*(4), 304–308. https://doi.org/10.1177/2167696818772653

Benjamini, Y., & Hochberg, Y. (1995). Controlling the false discovery rate: A practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society. Series B. Methodological*, *57*(1), 289–300. https://doi.org/10.1111/j.2517-6161.1995.tb02031.x

Bowlby, J. (1982). *Attachment and loss*. Basic Books.

Brown, M., Medlin, M. M., Sacco, D. F., & Young, S. G. (2019). Facing competing motives: Testing for motivational tradeoffs in affiliative and pathogen-avoidant motives via extraverted face preferences. *Evolutionary Psychological Science*, *5*(4), 440–446. https://doi.org/10.1007/s40806-019-00200-5

Casper, W. J., & DePaulo, B. (2012). A new layer to inclusion: Creating singles-friendly work environments. In N. P. Reilly, M. J. Sirgy, & C. A. Gorman (Eds.), *Work and quality of life: Ethical practices in organizations* (pp. 217–234). Springer Science + Business Media. https://doi.org/10.1007/978-94-007-4059-4_12

Centers for Disease Control and Prevention (CDC). (2020, December 28). *COVIDView Summary ending on December 19, 2020*. https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/past-reports/12282020.html

Centers for Disease Control and Prevention (CDC). (2021, April 23). *Have you heard? We're at one-third!*. https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/past-reports/04232021.html

Cheng, J. T., Tracy, J. L., & Henrich, J. (2010). Pride, personality, and the evolutionary foundations of human social status. *Evolution and Human Behavior*, *31*(5), 334–347. https://doi.org/10.1016/j.evolhumbehav.2010.02.004

Chopik, W. J., Edelstein, R. S., & Fraley, R. C. (2013). From the cradle to the grave: Age differences in attachment from early adulthood to old age. *Journal of Personality*, *81*(2), 171–183. https://doi.org/10.1111/j.1467-6494.2012.00793.x

Cook, C. L., Krems, J. A., & Kenrick, D. T. (2021). Fundamental motives illuminate a broad range of individual and cultural variations in thought and behavior. *Current Directions in Psychological Science*, *30*(3), 242–250. https://doi.org/10.1177/0963721421996690

Cosmides, L., & Tooby, J. (2013). Evolutionary psychology: New perspectives on cognition and motivation. *Annual Review of Psychology*, *64*(1), 201–229. https://doi.org/10.1146/annurev.psych.121208.131628

Crawford, M. T., Sherman, S. J., & Hamilton, D. L. (2002). Perceived entitativity, stereotype formation, and the interchangeability of group members. *Journal of Personality and Social Psychology*, *83*(5), 1076–1094. https://doi.org/10.1037/0022-3514.83.5.1076

Cuddy, A. J. C., Wolf, E. B., Glick, P., Crotty, S., Chong, J., & Norton, M. I. (2015). Men as cultural ideals: Cultural values moderate gender stereotype content. *Journal of Personality and Social Psychology*, *109*(4), 622–635. https://doi.org/10.1037/pspi0000027

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Diallo, T. M. O., Morin, A. J. S., & Lu, H. (2017). Performance of growth mixture models in the presence of time-varying covariates. *Behavior Research Methods*, *49*(5), 1951–1965. https://doi.org/10.3758/s13428-016-0823-0

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment*, *49*(1), 71–75. https://doi.org/10.1207/s15327752jpa4901_13

Enders, C. K. (2010). *Applied missing data analysis*. Guilford Press.

European Centre for Disease Prevention and Control (ECDC). (2020, December 21). *First COVID-19 vaccine authorised for use in the European Union*. https://www.ecdc.europa.eu/en/news-events/first-covid-19-vaccine-authorised-use-european-union

European Centre for Disease Prevention and Control (ECDC). (2022, August 11). *COVID-19 Vaccine tracker*. https://vaccinetracker.ecdc.europa.eu/public/extensions/COVID-19/vaccine-tracker.html#uptake-tab

Feeney, B. C., & Collins, N. L. (2014). A theoretical perspective on the importance of social connections for thriving. In M. Mikulincer & P. R. Shaver (Eds.), *Mechanisms of social connection: From brain to group* (pp. 291–314). American Psychological Association. https://doi.org/10.1037/14250-017

Ferguson, S. L. G., Moore, E. W., & Hull, D. M. (2020). Finding latent groups in observed data: A primer on latent profile analysis in Mplus for applied researchers. *International Journal of Behavioral Development*, *44*, 458–468. https://doi.org/10.1177/0165025419881721

Fisher, A. N., & Sakaluk, J. K. (2020). Are single people a stigmatized 'group'? Evidence from examinations of social identity, entitativity, and perceived responsibility. *Journal of Experimental Social Psychology*, *86*, Article 103844. https://doi.org/10.1016/j.jesp.2019.103844

Fisher, A. N., Stinson, D. A., Wood, J. V., Holmes, J. G., & Cameron, J. J. (2021). Singlehood and attunement of self-esteem to friendships. *Social Psychological and Personality Science*, *12*(7), 1326–1334. https://doi.org/10.1177/1948550620988460

Fraley, R. C., Heffernan, M. E., Vicary, A. M., & Brumbaugh, C. C. (2011). The Experiences in Close Relationships–Relationship Structures questionnaire: A method for assessing attachment orientations across relationships. *Psychological Assessment*, *23*(3), 615–625. https://doi.org/10.1037/a0022898

Gillath, O., Karantzas, G. C., & Lee, J. (2019). Attachment and social networks. *Current Opinion in Psychology*, *25*, 21–25. https://doi.org/10.1016/j.copsyc.2018.02.010

Girme, Y., Park, Y., & MacDonald, G. (in press). Coping or thriving? Highlighting intrapersonal, interpersonal, and societal factors associated with well-being in singlehood from a within-group perspective. *Perspectives on Psychological Science*.

Girme, Y. U., Overall, N. C., & Hammond, M. D. (2019). Facilitating autonomy in interdependent relationships: Invisible support facilitates highly avoidant individuals' autonomy. *Journal of Family Psychology*, *33*(2), 154–165. https://doi.org/10.1037/fam0000488

Greitemeyer, T. (2009). Stereotypes of singles: Are singles what we think? *European Journal of Social Psychology*, *39*(3), 368–383. https://doi.org/10.1002/ejsp.542

Heckhausen, J. (1997). Developmental regulation across adulthood: primary and secondary control of age-related challenges. *Developmental Psychology*, *33*(1), 176–187. https://doi.org/10.1037/0012-1649.33.1.176

Hostetler, A. J. (2009). Single by choice? Assessing and understanding voluntary singlehood among mature gay men. *Journal of Homosexuality*, *56*(4), 499–531. https://doi.org/10.1080/00918360902821486

Jackson, J. J., & Kirkpatrick, L. A. (2007). The structure and measurement of human mating strategies: Toward a multidimensional model of

sociosexuality. *Evolution and Human Behavior*, *28*(6), 382–391. https://doi.org/10.1016/j.evolhumbehav.2007.04.005

Kafetsios, K., Chatzakou, D., Tsigilis, N., & Vakali, A. (2017). Experience of emotion in face to face and computer-mediated social interactions: An event sampling study. *Computers in Human Behavior*, *76*, 287–293. https://doi.org/10.1016/j.chb.2017.07.033

Kenrick, D. T., Neuberg, S. L., Griskevicius, V., Becker, D. V., & Schaller, M. (2010). Goal-driven cognition and functional behavior: The fundamental-motives framework. *Current Directions in Psychological Science*, *19*(1), 63–67. https://doi.org/10.1177/0963721409359281

Kislev, E. (2021). The sexual activity and sexual satisfaction of singles in the second demographic transition. *Sexuality Research and Social Policy*, *18*(3), 726–738. https://doi.org/10.1007/s13178-020-00496-0

Ko, A., Pick, C. M., Kwon, J. Y., Barlev, M., Krems, J. A., Varnum, M. E. W., Neel, R., Peysha, M., Boonyasiriwat, W., Brandstätter, E., Crispim, A. C., Cruz, J. E., David, D., David, O. A., de Felipe, R. P., Fetvadjiev, V. H., Fischer, R., Galdi, S., Galindo, O., … Kenrick, D. T. (2020). Family matters: Rethinking the psychology of human social motivation. *Perspectives on Psychological Science*, *15*(1), 173–201. https://doi.org/10.1177/1745691619872986

Laurin, K., Kille, D. R., & Eibach, R. P. (2013). "The way I am is the way you ought to be": Perceiving one's relational status as unchangeable motivates normative idealization of that status. *Psychological Science*, *24*(8), 1523–1532. https://doi.org/10.1177/0956797612475095

Lehmann, V., Tuinman, M. A., Braeken, J., Vingerhoets, A. J., Sanderman, R., & Hagedoorn, M. (2015). Satisfaction with relationship status: Development of a new scale and the role in predicting well-being. *Journal of Happiness Studies*, *16*(1), 169–184. https://doi.org/10.1007/s10902-014-9503-x

Lesthaeghe, R. (2010). The unfolding story of the second demographic transition. *Population and Development Review*, *36*(2), 211–251. https://doi.org/10.1111/j.1728-4457.2010.00328.x

Locke, K. D. (2008). Attachment styles and interpersonal approach and avoidance goals in everyday couple interactions. *Personal Relationships*, *15*(3), 359–374. https://doi.org/10.1111/j.1475-6811.2008.00203.x

MacDonald, G., & Park, Y. (2022). Associations of attachment avoidance and anxiety with life satisfaction, satisfaction with singlehood, and desire for a romantic partner. *Personal Relationships*, *29*(1), 163–176. https://doi.org/10.1111/pere.12416

Maner, J. K., Kenrick, D. T., Becker, D. V., Robertson, T. E., Hofer, B., Neuberg, S. L., Delton, A. W., Butner, J., & Schaller, M. (2005). Functional projection: How fundamental social motives can bias interpersonal perception. *Journal of Personality and Social Psychology*, *88*(1), 63–78. https://doi.org/10.1037/0022-3514.88.1.63

Meyer, J. P., & Morin, A. J. (2016). A person-centered approach to commitment research: Theory, research, and methodology. *Journal of Organizational Behavior*, *37*(4), 584–612. https://doi.org/10.1002/job.2085

Mikulincer, M., & Shaver, P. R. (2016). *Attachment in adulthood: Structure, dynamics, and change* (2nd ed.). Guilford Press.

Milek, A., Butler, E. A., Tackman, A. M., Kaplan, D. M., Raison, C. L., Sbarra, D. A., Vazire, S., & Mehl, M. R. (2018). "Eavesdropping on happiness" revisited: A pooled, multisample replication of the association between life satisfaction and observed daily conversation quantity and quality. *Psychological Science*, *29*(9), 1451–1462. https://doi.org/10.1177/0956797618774252

Morin, A. J. S., & Litalien, D. (2019). Mixture modeling for lifespan developmental research. *Oxford research encyclopedia of psychology*. Oxford University Press. https://doi.org/10.1093/acrefore/9780190236557.013.364

Morin, A. J. S., & Marsh, H. W. (2015). Disentangling shape from level effects in person-centered analyses: An illustration based on university teachers' multidimensional profiles of effectiveness. *Structural Equation Modeling*, *22*(1), 39–59. https://doi.org/10.1080/10705511.2014.919825

Morin, A. J. S., McLarnon, M. J. W., & Litalien, D. (2020). Mixture modeling for organizational behavior research. In Y. Griep & S. Hansen (Eds.), *Handbook on the temporal dynamics of organizational behavior* (pp. 351–379). Edward Elgar Publishing. https://doi.org/10.4337/9781788974387.00031

Muthén, L. K., & Muthén, B. O. (1998–2017). *Mplus user's guide*. (8th ed.).

Neel, R., Brown, N. A., & Sng, O. (2020). Evolutionary perspectives on situations. In J. F. Rauthmann, R. A. Sherman, & D. C. Funder (Eds.), *The Oxford handbook of psychological situations* (pp. 111–123). Oxford University Press.

Neel, R., Kenrick, D. T., White, A. E., & Neuberg, S. L. (2016). Individual differences in fundamental social motives. *Journal of Personality and Social Psychology*, *110*(6), 887–907. https://doi.org/10.1037/pspp0000068

Newby-Clark, I. R., McGregor, I., & Zanna, M. P. (2002). Thinking and caring about cognitive inconsistency: When and for whom does attitudinal ambivalence feel uncomfortable? *Journal of Personality and Social Psychology*, *82*(2), 157–166. https://doi.org/10.1037/0022-3514.82.2.157

Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling*, *14*(4), 535–569. https://doi.org/10.1080/10705510701575396

Organisation for Economic Co-Operation and Development (OECD). (2016). *SF1.1: Family size and household composition* [PDF file]. https://www.oecd.org/els/family/SF_1_1_Family_size_and_composition.pdf

Organisation for Economic Co-Operation and Development (OECD). (2019). *SF3.1: Marriage and divorce rates* [PDF file]. https://www.oecd.org/els/family/SF_3_1_Marriage_and_divorce_rates.pdf

Park, H., Joo, J., Quiroz, B., & Greenfield, P. M. (2015). Sociodemographic factors influence cultural values: Comparing European American with Korean mothers and children in three settings—rural Korea, urban Korea, and Los Angeles. *Journal of Cross-Cultural Psychology*, *46*(9), 1131–1149. https://doi.org/10.1177/0022022115600258

Park, Y., Impett, E. A., & MacDonald, G. (2021). Singles' sexual satisfaction is associated with more satisfaction with singlehood and less interest in marriage. *Personality and Social Psychology Bulletin*, *47*(5), 741–752. https://doi.org/10.1177/0146167220942361

Park, Y., & MacDonald, G. (2022). Necessities and luxuries in satisfying single lives. *Journal of Social and Personal Relationships*. Advance online publication. https://doi.org/10.1177/02654075221122887

Park, Y., Page-Gould, E., & MacDonald, G. (2022). Satisfying singlehood as a function of age and cohort: Satisfaction with being single increases with age after midlife. *Psychology and Aging*, *37*(5), 626–636. https://doi.org/10.1037/pag0000695

Pepping, C. A., & MacDonald, G. (2019). Adult attachment and long-term singlehood. *Current Opinion in Psychology*, *25*, 105–109. https://doi.org/10.1016/j.copsyc.2018.04.006

Pepping, C. A., MacDonald, G., & Davis, P. J. (2018). Toward a psychology of singlehood: An attachment-theory perspective on long-term singlehood. *Current Directions in Psychological Science*, *27*(5), 324–331. https://doi.org/10.1177/0963721417752106

Pinquart, M. (2003). Loneliness in married, widowed, divorced, and never-married older adults. *Journal of Social and Personal Relationships*, *20*(1), 31–53. https://doi.org/10.1177/0265407503020001186

Poortman, A. R., & Liefbroer, A. C. (2010). Singles' relational attitudes in a time of individualization. *Social Science Research*, *39*(6), 938–949. https://doi.org/10.1016/j.ssresearch.2010.03.012

Raymo, J. M., Park, H., Xie, Y., & Yeung, W. J. J. (2015). Marriage and family in East Asia: Continuity and change. *Annual Review of Sociology*, *41*(1), 471–492. https://doi.org/10.1146/annurev-soc-073014-112428

Ren, D., & Evans, A. M. (2021). Leaving the loners alone: Dispositional preference for solitude evokes ostracism. *Personality and Social Psychology Bulletin*, *47*(8), 1294–1308. https://doi.org/10.1177/0146167220968612

Sacco, D. F., Young, S. G., & Hugenberg, K. (2014). Balancing competing motives: Adaptive trade-offs are necessary to satisfy disease avoidance and interpersonal affiliation goals. *Personality and Social Psychology Bulletin*, *40*(12), 1611–1623. https://doi.org/10.1177/0146167214552790

Scheling, L., & Richter, D. (2021). Generation Y: Do millennials need a partner to be happy? *Journal of Adolescence*, *90*(1), 23–31. https://doi.org/10.1016/j.adolescence.2021.05.006

Shapiro, A., & Keyes, C. L. M. (2008). Marital status and social well-being: Are the married always better off? *Social Indicators Research*, *88*(2), 329–346. https://doi.org/10.1007/s11205-007-9194-3

Shin. (2021, June 20). 429 New cases … About 30% of the population has received the first dose. *KBS News*. https://news.kbs.co.kr/news/view.do?ncd=5213800

Simpson, R. (2016). Singleness and self-identity: The significance of partnership status in the narratives of never-married women. *Journal of Social and Personal Relationships*, *33*(3), 385–400. https://doi.org/10.1177/0265407515611884

Spielmann, S. S., MacDonald, G., Maxwell, J. A., Joel, S., Peragine, D., Muise, A., & Impett, E. A. (2013). Settling for less out of fear of being single. *Journal of Personality and Social Psychology*, *105*(6), 1049–1073. https://doi.org/10.1037/a0034628

Sun, J., Harris, K., & Vazire, S. (2020). Is well-being associated with the quantity and quality of social interactions? *Journal of Personality and Social Psychology*, *119*(6), 1478–1496. https://doi.org/10.1037/pspp0000272

Tein, J. Y., Coxe, S., & Cham, H. (2013). Statistical power to detect the correct number of classes in latent profile analysis. *Structural Equation Modeling*, *20*(4), 640–657. https://doi.org/10.1080/10705511.2013.824781

Thompson, M. M., Zanna, M. P., & Griffin, D. W. (1995). Let's not be indifferent about (attitudinal) ambivalence. In R. E. Petty & J. A. Krosnick (Eds.), *Attitude strength: Antecedents and consequences* (pp. 361–386). Lawrence Erlbaum Associates.

van Tilburg, T. G. (2022). Emotional, social, and existential loneliness before and during the COVID-19 pandemic: Prevalence and risk factors among Dutch older adults. *The Journals of Gerontology: Series B*, *77*(7), e179–e184. https://doi.org/10.1093/geronb/gbab101

Wang, C. D. C., Jin, L., Han, G., Zhu, W., & Bismar, D. (2022). Cross-cultural differences in adult attachment and depression: A culturally congruent approach. *Journal of Counseling Psychology*, *69*(3), 298–310. https://doi.org/10.1037/cou0000589

Wrosch, C., & Heckhausen, J. (1999). Control processes before and after passing a developmental deadline: Activation and deactivation of intimate relationship goals. *Journal of Personality and Social Psychology*, *77*(2), 415–427. https://doi.org/10.1037/0022-3514.77.2.415

Yang, C. C. (2006). Evaluating latent class analysis models in qualitative phenotype identification. *Computational Statistics & Data Analysis*, *50*(4), 1090–1104. https://doi.org/10.1016/j.csda.2004.11.004

Received February 27, 2022
Revision received November 13, 2022
Accepted November 22, 2022 ■