



Basic psychological need satisfaction across the retirement transition: Changes and longitudinal associations with depressive symptoms

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Abstract

Drawing on self-determination theory, the present study examined how satisfaction of the basic psychological needs (autonomy, competence, and relatedness) changes across the retirement transition and how need satisfaction was related to depressive symptoms across the retirement transition. Participants ($N = 2655$) were drawn from the HHealth, Ageing and Retirement Transitions in Sweden (HEARTS) study. Latent growth curve modeling showed that autonomy need satisfaction increased across the retirement transition, whereas competence and relatedness remained relatively stable. Higher need satisfaction was related to less depressive symptoms at baseline, however, pre-retirement need satisfaction was not a statistically significant predictor of subsequent changes in depressive symptoms (or vice versa) across the retirement transition. At the within-person level, higher than usual need satisfaction at a specific time point was related to less than usual depressive symptoms. Need satisfaction may be an important factor to consider across the retirement transition and need satisfying activities prior, during, and after the transition may ease peoples' adjustment to retirement.

Keywords HEARTS study · Need satisfaction · Retirement · Self-determination theory · Well-being

Introduction

Retirement is a major life course event in adult life. How people adjust to the transition from work to retirement has gained increased interest in psychological research in recent years (e.g., Aspinwall 2005; Barbosa et al. 2016; Bye and Pushkar 2009; Custers et al. 2014; Wang and Shi 2014).

A better understanding of how people adjust to retirement is important because it provides information about how to improve the quality of postretirement life, besides the opportunity to understand how people adjust to internal (i.e., physical and psychological aging) and external (i.e., lifestyle and societal norms) challenges in later life (Wang et al. 2011). Researchers often rely on various well-being outcomes to understand how people adjust to retirement life (Wang 2012). When measured longitudinally across the retirement transition and into post-retirement, changes and variability in these outcomes can be used as an indication of retirement adjustment (Wang 2012; Wang and Shi 2014).

A theoretical framework that is particularly suited to understand changes in well-being is self-determination theory (SDT; Ryan and Deci 2017). SDT outlines three basic psychological needs—autonomy, competence, and relatedness—and postulates that an individual's well-being and functioning are dependent upon the satisfaction of these needs. Evidence from numerous studies has shown that satisfaction of these basic psychological needs is vital for peoples' well-being in various contexts and cultures (e.g., Chen et al. 2015; Church et al. 2013; Kloos et al. 2018; Ng et al. 2012; Van den Broeck et al. 2016). The degree of

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one's need satisfaction is in turn affected by various individual, environmental, and social factors (Ryan and Deci 2017). It is therefore likely that need satisfaction is affected by major life events, such as retirement. Research on changes in need satisfaction across the retirement transition is scarce (see Henning et al. 2019b for the only published study on the topic to date). To our knowledge, there is no study that specifically has examined how change in need satisfaction is linked to psychological well-being across the retirement transition, which is the focus of the present study.

The present study makes three main contributions to the SDT and retirement literature. First, it provides knowledge of how basic psychological need satisfaction changes across retirement, which is a major life event in adult life. Second, by using SDT we provide a strong theory-based explanation of potential mechanisms underlying changes in psychological well-being across the retirement transition. Third, it paves the way for an integration of SDT's concept of basic psychological needs (Ryan and Deci 2017) and theories of retirement adjustment (e.g., the resource-based dynamic model for retirement adjustment; Wang et al. 2011).

Basic psychological need satisfaction and well-being

SDT postulates that all humans have basic psychological needs, which are described as "...specifiable psychological and social nutrients which, when satisfied within the interpersonal and cultural contexts of an individual's development, facilitate growth, integrity, and well-being" (Ryan and Deci 2017, p. 82). Within SDT, the basic psychological needs are assumed to be universal, and the satisfaction of these needs are considered to be crucial for well-being and functioning of all humans in all contexts across the lifespan (Ryan and La Guardia 2000). Although one may view a particular need as less important than the others, lack of satisfaction or thwarting of any of the basic psychological needs will lead to adverse effects for the individual (Chen et al. 2015; Ryan and Deci 2017). The three basic psychological needs outlined by SDT are autonomy, competence, and relatedness (Ryan and Deci 2017). Autonomy refers to feeling volition, willingness, self-endorsement, and ownership of one's actions and behaviors (de Charms 1968). Competence refers to feeling effective in one's interactions with the social environment and experiencing opportunities to express and develop one's capacities and skills (White 1959). Relatedness refers to feeling cared for, care for others, and having a sense of belongingness (Baumeister and Leary 1995).

Although numerous studies support the central role of need satisfaction for well-being in a variety of contexts (e.g., Ng et al. 2012; Van den Broeck et al. 2016; Vansteenkiste and Ryan 2013), most of this research has involved young and middle-aged adults (Ryan and Deci 2017; Ryan and La Guardia 2000). SDT has received little

attention when it comes to the study of older adults (Coleman 2000; Neubauer et al. 2017), though some studies (primarily cross-sectional studies) have been focused on older adults living in residential or nursing homes (Custers et al. 2010; Ferrand et al. 2014; Kasser and Ryan 1999; O'Connor and Vallerand 1994; Vallerand et al. 1995) or older adults (mean age > 73) not living in residential or nursing homes (Mackenzie et al. 2018; Vanhove-Meriaux et al. 2018). The general findings suggest that need satisfaction is positively related to psychological well-being (including measures of depressive symptoms).

Longitudinal associations between need satisfaction and well-being in older adults were recently examined in two studies (Custers et al. 2014; Neubauer et al. 2017). Neubauer et al. (2017) found that perceived competence, but not autonomy, predicted intraindividual fluctuations in subjective well-being among very old adults (87–97 years at baseline). At the between-person level, autonomy and competence were negative predictors of negative affect, whereas only competence positively predicted positive affect and life satisfaction. Custers et al. (2014) found that depressive symptoms were negatively related to need satisfaction (assessed at the global level) over the first 8 months individuals resided in a nursing home.

Although these findings are promising, they are limited in several ways (Neubauer et al. 2017). First, many studies did not assess all three needs and emphasis was placed on the importance of perceived autonomy, particularly in the early studies (e.g., Kasser and Ryan 1999; O'Connor and Vallerand 1994; Vallerand et al. 1989). Given that all three needs are considered essential for well-being and that they often are interrelated, it is important to examine all three needs. Second, many studies focused on older adults living in residential or nursing homes (Custers et al. 2010; Ferrand et al. 2014; Kasser and Ryan 1999; O'Connor and Vallerand 1994; Vallerand et al. 1995), which only represents select samples of the aging population (e.g., 4.3% of the over 65 population in Sweden; OECD 2019). Hence, we do not know if these findings generalize to other samples or settings (e.g., in younger samples of older adults across transitions such as retirement). Third, most of these studies had a cross-sectional design, which is likely to provide poor representations of longitudinal processes (Gollob and Reichardt 1987; Shipp and Cole 2015), and cross-sectional studies disregard the temporal nature of the theoretical postulates in SDT (e.g., is need satisfaction related to well-being over time). We addressed these past limitations in the current study by assessing autonomy, competence, and relatedness across three consecutive years in a community-dwelling sample of retirement-aged adults, which is a much more representative sample compared to samples studied in previous research.

Need satisfaction across the retirement transition

There are several potential reasons why need satisfaction might change across the retirement transition. Previous research indicates that people experience a general increase in autonomy with age (Sheldon et al. 2006; Sheldon and Kasser 2001). Sheldon and colleagues argued that this increase in autonomy may be a consequence of an increased psychological maturity and that people over time find more ways to feel a sense of volition in life. Following this logic it is reasonable to assume that autonomy need satisfaction might increase across the retirement transition due to more time to pursue intrinsically motivated goals in the absence of career responsibilities. An increase in autonomy has been found across the retirement transition (i.e., across two waves of data, 1 year between measurement points) in the same data set that we use in the current study (Henning et al. 2019b; Lindwall et al. 2017). *Based on these previous findings we hypothesized that autonomy need satisfaction would increase across the retirement transition (H1).*

For some people it may be more difficult to fulfil the need for competence when leaving ones professional life, but retirement may also increase opportunities for new challenges and the development or maintenance of skills. Such adjustment strategies are described in the motivational theory of life-span development. This theory suggests that a key criterion for adaptive development is the extent to which people realize control over their environment (i.e., primary control) across different domains in life and across the life span (Heckhausen et al. 2010). As such, primary control processes are conceptualized as changing the environment to be in line with one's wishes. The theory also outlines secondary control processes, which are defined as changing oneself to be more in line with environmental forces (Heckhausen et al. 2010). These secondary control processes are to a large extent focused on internal processes and help to minimize losses in, maintain, or expand existing levels of primary control (Heckhausen and Schulz 1995). Although striving for primary control is maintained throughout the life course, with increasing age people adjust their goal aspirations according to the available means and opportunities. Results from the aging literature show that older adults are well capable of managing age-related challenges through such measures (Heckhausen et al. 2010).

Consequently, once the work-related experience of competence is not available anymore, many retirees are probably able to find new sources for competence in retirement (Henning et al. 2019a). For example, earlier results from the HEARTS study showed that participants seem to engage more in leisure activities or voluntary work after retirement (Henning et al. 2020). Leisure activity is known to fulfill the needs for competence and relatedness (Leversen et al. 2012) and it has been argued that activity engagement can help

to maintain perceived continuity in retirement by replacing the work role (Atchley 1976; van Ingen and Wilson 2017). *Based on the tenets of the motivational theory of life-span development we hypothesized that competence need satisfaction would not change across the retirement transition (H2).*

Retirement might lead to a reduction in social relationships as the daily contact with colleagues disappears, but it might also provide opportunities for more (or higher quality) social interactions. Research shows that older adults peak in social network size around the retirement age indicating a stronger preference and more opportunities to gain and maintain social relationships around the retirement age (Suanet and Huxhold 2018). Moreover, given that older people tend to pursue intrinsically motivated goals rather than extrinsically motivated goals they may be more able to orient towards activities that may satisfy their basic psychological need of relatedness (Sheldon and Kasser 2001). Finally, as mentioned before, a previous study based on the HEARTS sample found increased engagement in social activities after retirement (Henning et al. 2020). However, even if the number of social contacts should decline over retirement, this does not necessarily mean that feelings of relatedness should decline. According to the socioemotional selectivity theory peoples' time horizons influence their motivational priorities in different ways across the life course (Carstensen 1995, 2006). In young adulthood, when time is open-ended, people prioritize goals and activities that optimize the future. However, when time is limited, as is typically the case in older adulthood, people tend to seek out emotionally rewarding experiences and spend time with close social partners to optimize well-being in the present moment (Löckenhoff 2012). Hence, with retirement, people may improve relationships with close others and thus increase their feelings of relatedness. *We hypothesized that relatedness need satisfaction would increase across the retirement transition (H3).*

Need satisfaction and psychological well-being across retirement

Previous research shows that psychological well-being is likely to change across the retirement transition (e.g., Wang and Shi 2014), and that need satisfaction is associated with better psychological well-being across the lifespan (e.g., Mackenzie et al. 2018; Ng et al. 2012). However, few studies have examined the relation between need satisfaction and psychological well-being across the retirement transition. Houlfort et al. (2015) showed that post-retirement need satisfaction was positively associated with psychological well-being (i.e., psychological distress and life satisfaction). However, need satisfaction was only assessed at a single time point after the participants had retired, hence, they could not examine changes in need satisfaction across the retirement transition or associations between changes in need

satisfaction and psychological well-being. In a two-wave study using data from the HEalth, Ageing and Retirement Transitions in Sweden (HEARTS) study (Lindwall et al. 2017), Henning et al. (2019b) found an increase in autonomy need satisfaction among those who retired between waves, but no changes were observed in competence or relatedness need satisfaction across retirement. Another study using data from the HEARTS study showed that the within-person relation between autonomy need satisfaction and life satisfaction was stronger after retirement than before retirement and that the between-person relation between competence need satisfaction and life satisfaction was negative among workers and positive among retirees (Henning et al. 2019a). Taken together, these results provide an initial indication that need satisfaction may change across the retirement transition and that the magnitude of the relation between need satisfaction and psychological well-being can change across the retirement transition.

In line with SDT (Ryan and Deci 2017), we hypothesized that higher levels of need satisfaction would be related to less depressive symptoms at the between- and within-person level (H4). The between-person level refers to relations between the intercepts and the within-person level refers to relations between occasion-specific deviations from the participants' own mean trajectory. Grounded in the tenets of SDT (Ryan and Deci 2017) and previous findings on the link between need satisfaction and well-being in older adults (Tang et al. 2019), we hypothesized that increases in need satisfaction across the retirement transition would be related to decreases in depressive symptoms (H5). Finally, we also examined the direction of relations between need satisfaction and depressive symptoms. Based on previous findings (e.g., Custers et al. 2014; Ng et al. 2012) we hypothesized that higher pre-retirement levels of need satisfaction would be related to decreases in depressive symptoms across retirement (H6). We also examined the link between pre-retirement levels of depressive symptoms and changes in need satisfaction across retirement. However, we did not have any hypotheses about these relations and consider them as exploratory analyses.

Method

Participants and procedure

Participants in the present study were drawn from the Swedish HEARTS study (Lindwall et al. 2017). The HEARTS sample comprises 5913 individuals aged 60–66 at baseline that completed the questionnaire in 2015. The HEARTS sample originates from a representative population-based sample of 14,990 individuals aged 60–66 years and is representative of the general population in terms of age and sex,

but is slightly more highly educated, and consists mostly of Swedish born individuals (84.7%). Ethical approval for the HEARTS study was granted from the ethical review board at the University of Gothenburg (Dnr: 970-14). Informed consent was obtained from all participants included in the HEARTS study and the study was conducted in accordance with the Declaration of Helsinki. The survey was conducted online, but participants had the option to complete a paper version of the survey. At baseline, 68.8% responded to the web-based survey and 31.2% responded to the paper version. A complete description of the HEARTS study design, data collection, and sample is provided in Lindwall et al. (2017).

In the present study we included 2655 people across three waves of data collection (2015–2017). We only included those who reported their retirement status at all three waves. The total sample comprised 1519 females and 1136 males with a mean age of 62.9 ($SD = 2.0$, range 60–66 years) at baseline and they had on average of 13.6 years ($SD = 3.4$) of education. In the current sample 1.4% did not complete junior high school (i.e., grundskola) or had less than 9 years of schooling, 11.9% had junior high school degree (i.e., grundskola), 21.2% had a 2-year vocational school degree (i.e., fackskola/yrkesutbildning), 12.5% had a 3 to 4 year high school degree (i.e., gymnasium), 19.3% had a post high school degree or education but not a university degree (e.g., folk high school), and 33.3% had a university degree as the highest educational level. We included individuals who: (1) were working across the three waves (*workers*, $n = 1,282$, $M_{age} = 61.4$ [$SD = 1.3$], $M_{education} = 14.2$ [$SD = 3.5$] years, 54.8% female); (2) were retired across the three waves (*constantly retired*, $n = 750$, $M_{age} = 65.0$ [$SD = 1.3$], $M_{education} = 13.1$ [$SD = 3.1$] years, 58.3% female); (3) retired between wave 1 and wave 2 (*retired W2*, $n = 324$, $M_{age} = 63.7$ [$SD = 1.4$], $M_{education} = 13.2$ [$SD = 3.6$] years, 55.9% female); or (4) retired between wave 2 and wave 3 (*retired W3*, $n = 299$, $M_{age} = 62.9$ [$SD = 1.4$], $M_{education} = 13.2$ [$SD = 3.1$] years, 60.1% female). The working and constantly retired groups were included primarily as comparison groups for the retired W2 and retired W3 groups to obtain estimates of naturally occurring changes and associations in people at work or among those who are retired. Number of years since retirement in the constantly retired group ranged from less than 1 year to 6 years ($M = 2.0$, $SD = 1.4$).

Instruments

Retirement

The following question was used to determine the participants' retirement status "Are you retired (i.e., have started to receive old age pension)?" Four different response options were available (a) *No*; (b) *Yes—but continue working and do not perceive myself as a pensioner*; (c) *Yes—continue*

working but perceive myself as a pensioner; and (d) Yes—full-time retired. Those responding (a) at each time point were categorized as *workers*, whereas those responding (d) at each time point were categorized as *constantly retired*. Those responding (a) at the first time point and (d) at the second and third time point were categorized as *retired W2*, whereas those responding (a) at the first and second time point and (d) at the third time point were categorized as *retired W3*. Thus, in the current study we only included those transitioning from working to full retirement.

Basic psychological need satisfaction

We used an abbreviated version of the basic psychological needs satisfaction and frustration scale (BPNSFS; Chen et al. 2015) to assess participants basic psychological need satisfaction at the global level. This abbreviated version consisted of three 3-item scales assessing satisfaction of the needs for autonomy, competence, and relatedness (see Table S1 in the supplemental material). Responses were given on a 5-point Likert scale ranging from 1 (*Completely false*) to 5 (*Completely true*). Previous research has shown that the original 24-item BPNSFS has adequate factorial validity and internal consistency, displays cross-cultural equivalence, and has provided support for its nomological network (Chen et al. 2015; Tóth-Király et al. 2018). Reliability estimates (ω) across the groups ranged from 0.657 to 0.719 for autonomy, 0.637 to 0.691 for competence, and 0.678 to 0.754 for relatedness.

Depressive symptoms

Depressive symptoms were assessed with an 8-item (i.e., “I felt depressed”) version of the Center for Epidemiological Studies—Depression scale (CES-D; Radloff 1977). The CES-D 8 has in previous research shown adequate factorial validity and invariance across age, countries, and gender (Missinne et al. 2014; Van de Velde et al. 2010). Participants were asked to rate how often they had experienced each statement during the last week and responses were given on a 4-point scale ranging from 0 (*Rarely/none of the time*) to 3 (*Most/all of the time*). Reliability estimates (ω) across the groups ranged from 0.632 to 0.674 for depressive symptoms.

The reliability estimates are reasonable considering the low number of items per scale (at least for the BPNSFS sub-scales) and that the items retained in the abbreviated versions of the BPNSFS and CES-D 8 were intended to cover broad constructs of need satisfaction and depressive symptoms, respectively. However, given the modest reliability estimates, it is important to use latent variable models that correct for unreliability (Marsh et al. 2013).

Control variables

In the multivariate latent growth curve models (described below), we controlled for a number of variables that previous research has shown can influence peoples’ well-being and adjustment to retirement (cf. Barbosa et al. 2016; Lu and Shelley 2019; Nyberg et al. 2019). Age, sex, years of education, civil status (coded as 1 = married/partner, 0 = not married or partner), income satisfaction, leisure activities, and self-rated health were included as control variables. Income satisfaction was assessed with a single-item at W2 and W3 “How satisfied are you with your current financial situation?” and responses were given on a five-point Likert scale ranging from 1 (*very satisfied*) to 5 (*very dissatisfied*). Leisure activity engagement was assessed with a list of 20 items measuring social, intellectual, and physical leisure activities. This scale has been used in previous studies on the HEARTS sample (cf. Henning et al. 2020). Responses were given on a scale ranging from 0 (*never or almost never*) to 5 (*everyday*). A mean score was calculated based on the 20 activities and included as a control variable. Self-rated health was assessed with the item “How do you rate your overall health condition?” and responses were given on a 6-point scale ranging from 1 (*very bad*) to 6 (*very good*). Control over retirement was assessed with one item phrased “Was it your decision to retire, or did you feel forced to do so (e.g., by health or organizational reasons etc.)?”. Response options were 1 “It was my decision (100% my choice)”, 2 “It was mostly my decision (~75% my choice)”, 3 “It was partly my decision (~50% my choice)”, 4 “It was my decision to a small extent (~25% my choice)”, and 5 “It was not my decision, I was forced (0% my choice)”. All control variables, except income satisfaction, were collected at W1 and included as time-invariant predictors of the intercept and slope factors. Income satisfaction was used as a time-varying covariate at W2 and W3; income satisfaction was not collected at W1.

Statistical analysis

The statistical analyses were performed in Mplus version 8.4 (Muthén and Muthén 1998–2017) and the robust full information maximum likelihood estimator (MLR) was used to analyze the data. Missing data were handled using the full information MLR (Enders 2010). First, we estimated longitudinal confirmatory factor analysis (CFA) of the multi-item scales (i.e., BPNSFS and CES-D 8) to examine the factorial structure and measurement invariance to ensure that the same construct was assessed across groups and time (Little 2013). Configural, metric, and scalar invariance were examined in the present study. The configural model examines the similarity in the overall pattern of parameters across time and groups, but no equality constraints are imposed in the

configural model. In the second step, we examined metric invariance, which relates to the invariance of the factor loadings across time and groups. Finally, scalar measurement invariance is examined when both the factor loadings and item intercepts are constrained to equality across time and groups. Establishing scalar invariance enables one to interpret changes in the latent means as changes in the latent construct (Marsh et al. 2010). We used the effects coding method of scaling, which is nonarbitrary and provide the latent variables with the metric of the indicators (Little et al. 2006). Composite reliability was computed according to McDonald (1970) $\omega = (\sum \lambda_i) / (\sum \lambda_i^2 + \sum \delta_{ii})$ using the standardized parameters from the most invariant longitudinal models where λ_i are the factor loadings and δ_{ii} are the error variances.

Second, for each of the multi-item scales we estimated multi-group second-order latent growth curve models (LGCM; Bollen and Curran 2006; McArdle 1988), also referred to as curve-of-factors models, to examine changes across the retirement transition. Two interesting attributes of LGCMs are the latent slope (i.e., the rate of change) and intercept (i.e., initial status) factors. The slope mean represents the average rate of change (i.e., the group mean) in the outcome variable per unit change of time and the slope variance represents individual deviations from the group mean. The intercept in the present study represents the group mean at the first measurement point and the intercept variance corresponds to individual differences around the group mean.

Third, in addition to the individual growth trajectories of the three basic psychological needs, we also examined changes in global need satisfaction across the retirement transition. We estimated a factor-of-curves (FOCUS) model (Isiordia et al. 2017; McArdle 1988) to examine whether a common “cause” or a factor is responsible for the associations among the developmental processes of the three needs. At the first level of the FOCUS model the individual univariate LGCMs are specified that characterize the independent trajectory of each construct (i.e., autonomy, competence, and relatedness). At the second level of the FOCUS model a second-order intercept and slope factor are specified to examine whether a higher-order factor structure drives the relation among the developmental trajectories of the constructs the first level (Isiordia et al. 2017). Retirement status was included as dummy coded predictors of the second-order slope and intercept factors in the FOCUS model.

Fourth, to assess associations between need satisfaction and depressive symptoms across the retirement transition we estimated multivariate LGCM (Bollen and Curran 2006). The relations between the slope factors indicate whether change in two constructs over time is related, whereas the association between the intercept factors indicates the relation at the first measurement point. Covariances between the intercept and slope factors were estimated within

variables, whereas the slope of one variable (e.g., depressive symptoms) was regressed on the intercept of the other (e.g., autonomy need satisfaction) to examine the relations between pre-retirement level and changes across the retirement transition. We also estimated residual covariances, which are within-person associations between occasion-specific deviations from the participants’ own mean trajectory (Sliwinski and Mogle 2008). Whereas the correlations between the slopes capture relations in the average rate of change between two constructs (i.e., between-person differences in within-person change), the residual covariances capture within-person relations at each measurement point. That between- and within-person analyses can diverge is well documented in the literature (e.g., Hofer and Sliwinski 2006), which highlights the importance of examining relations at both levels of analysis to gain a more detailed understanding of the relations of interest.

Conventional fit indices such as the comparative fit index (CFI), the Tucker-Lewis Index (TLI), the standardized root mean residual (SRMR), and the root mean square error of approximation (RMSEA) were used to assess model fit. CFI and TLI values around 0.90 and SRMR and RMSEA values around 0.08 indicated acceptable model fit (Marsh 2007). The nested longitudinal invariance models were evaluated using Chen (2007) recommendations that change in CFI (Δ CFI) of less than 0.010 and change in RMSEA (Δ RMSEA) of less than 0.015 or a change in SRMR (Δ SRMR) of less than 0.030 would support metric invariance. For scalar invariance, a change in CFI (Δ CFI) of less than 0.010 and change in RMSEA (Δ RMSEA) of less than 0.015 or a change in SRMR (Δ SRMR) of less than 0.010 would indicate invariance across time and groups. It is important to remember that these are all rough guidelines, not “golden rules” (Marsh et al. 2004). We agree with Marsh et al. (2010) that “Ultimately, however, an evaluation of goodness of fit must be based upon a subjective integration of many sources of information, including fit indices, a detailed evaluation of parameter estimates in relation to a priori hypotheses, previous research, and common sense” (p. 477).

Results

Measurement invariance across groups and time

We examined longitudinal measurement invariance in a series of nested models. First, a configural model was estimated. Second, equality constraints were imposed on the factor loadings within groups across time (i.e., metric invariance within groups). Third, equality constraints were imposed on the factor loadings within and between groups across time (i.e., metric invariance within and between

Table 1 Longitudinal measurement invariance across time and groups in the multi-item scales (BPNSFS and CES-D 8) and model fit of the LGCMs

Model	χ^2	<i>df</i>	<i>p</i>	RMSEA [90% CI]	CFI	TLI	SRMR
Autonomy							
Configural	72.360	60	.1316	.018 [.000, .031]	.998	.994	.018
Metric within groups	81.598	76	.3095	.011 [.000, .025]	.999	.998	.025
Metric within and between groups	84.953	82	.3898	.007 [.000, .023]	.999	.999	.025
Scalar within groups	126.369	98	.0284	.021 [.007, .031]	.995	.992	.028
Scalar within and between groups	148.067	104	.0030	.025 [.015, .034]	.992	.989	.033
Second-order LGCM	206.031	110	< .001	.036 [.029, .044]	.982	.977	.045
Competence							
Configural	83.223	60	.0253	.024 [.009, .036]	.995	.988	.020
Metric within groups	97.613	76	.0482	.021 [.002, .032]	.995	.991	.028
Metric within and between groups	104.299	82	.0489	.020 [.002, .031]	.995	.992	.032
Scalar within groups	147.156	98	.0010	.028 [.018, .036]	.990	.985	.033
Scalar within and between groups	166.658	104	< .001	.030 [.021, .038]	.987	.982	.034
Second-order LGCM	175.027	110	< .001	.030 [.021, .038]	.986	.982	.036
Relatedness							
Configural	70.216	60	.1725	.016 [.000, .030]	.998	.995	.021
Metric within groups	81.790	76	.3043	.011 [.000, .025]	.999	.998	.031
Metric within and between groups	84.792	82	.3945	.007 [.000, .023]	.999	.999	.034
Scalar within groups	108.662	98	.2169	.013 [.000, .025]	.998	.997	.037
Scalar within and between groups	113.618	104	.2441	.012 [.000, .024]	.998	.997	.040
Second-order LGCM	137.191	112	.0531	.018 [.000, .028]	.994	.993	.046
Depressive symptoms							
Configural	2420.444	900	< .001	.050 [.048, .053]	.912	.891	.055
Metric within groups	2448.966	956	< .001	.049 [.046, .051]	.913	.900	.057
Metric within and between groups	2445.751	977	< .001	.048 [.045, .050]	.915	.903	.059
Scalar within groups	2568.756	1033	< .001	.047 [.045, .050]	.911	.904	.059
Scalar within and between groups	2645.825	1054	< .001	.048 [.045, .050]	.907	.903	.060
Second-order LGCM	2634.837	1058	< .001	.047 [.045, .050]	.908	.904	.060
Multivariate LGCM							
Autonomy—depressive symptoms	6120.384	2963	< .001	.040 [.039, .041]	.895	.888	.059
Competence—depressive symptoms	6023.328	2975	< .001	.039 [.038, .041]	.895	.889	.059
Relatedness—depressive symptoms	5879.779	2971	< .001	.038 [.037, .040]	.900	.894	.063

groups). Fourth, equality constraints were imposed on the intercepts within groups over time (i.e., scalar invariance within groups). Fifth, equality constraints were imposed on the intercepts within and across groups over time (i.e., scalar invariance within and between groups). As seen in Table 1, none of the constructs displayed changes in CFI, RMSEA, or SRMR larger than 0.010, 0.015, or 0.010 (or 0.030 for scalar invariance), respectively, when constraints were imposed across time and groups. Hence, scalar invariance was supported across time and groups for each subscale of the BPNSFS and the CES-D 8.

Changes in need satisfaction and depressive symptoms across retirement

Following the establishment of scalar invariance, we estimated multi-group second-order LGCMs to examine changes in the basic psychological needs across the retirement transition in the four groups (workers, constantly retired, retired W2, and retired W3). Model fit was adequate for all LGCMs and the model fit indices are presented in Table 1. The parameter estimates from the second-order LGCMs of need satisfaction are presented in Table 2. Autonomy need satisfaction increased in the retired W2 group (slope mean = 0.106, $p < 0.001$), retired W3 group (slope mean = 0.154, $p < 0.001$), and workers (slope mean = 0.023, $p = 0.010$), whereas the slope in the constantly retired group

Table 2 Intercept and slope estimates from the multigroup LGCMs of need satisfaction

	Autonomy			Competence			Relatedness			
	Working	Constantly Retired	Retired	Working	Constantly Retired	Retired	Working	Constantly Retired	Retired	
Intercept mean	3.745*	4.062*	3.871*	3.676*	3.986*	3.869*	3.870*	4.547*	4.498*	4.476*
Slope mean	0.023*	-0.006	0.106*	0.154*	0.036*	0.031	0.026	0.005	0.019	0.021
Intercept variance	0.298*	0.245*	0.272*	0.296*	0.242*	0.306*	0.262*	0.168*	0.202*	0.160*
Slope variance	0.033*	0.001	Set to 0	0.017	0.011	0.036*	0.001	0.004	0.013	0.001
Intercept-slope Covariance	-0.022	-0.002	Set to 0	-0.032	-0.004	-0.031	0.002	-0.010	-0.011	0.004
Intercept-slope correlation	-0.219*	-0.122	Set to 0	-0.453	-0.086	-0.292*	0.096	-0.395	-0.224	0.291

* $p < .05$

was not statistically significant (slope mean = -0.006, $p = 0.517$). Group comparisons of the slope estimates indicated that the retired W2 and retired W3 groups had a larger increase in autonomy compared to the working and constantly retired groups ($ps < 0.001$) and that the working group had a larger increase than the constantly retired group ($p = 0.029$). No statistically significant difference was found between the retired W2 and retired W3 groups ($p = 0.115$). A closer examination of the latent means at each wave (see Table 4) showed that the retired W2 group increased in autonomy need satisfaction between wave 1 and wave 2 (from 3.785 to 4.057), whereas the retired W3 group showed a similar increase between wave 2 and wave 3 (from 3.721 to 4.031). The working group also increased in autonomy need satisfaction across time, whereas the constantly retired group reported relatively stable levels of autonomy over time. The retired W2 and retired W3 groups reported similar levels of autonomy need satisfaction after retirement as the retired group. Thus, H1 (i.e., *that autonomy need satisfaction would increase across the retirement transition*) was supported.

For competence need satisfaction the multi-group second-order LGCM showed that neither the retired W2 group, the retired W3 group, nor the constantly retired group had a statistically significant change across the three waves (Table 2); only the change in the working group was statistically significant (slope mean = 0.036, $p < 0.001$). Group comparisons of the slope estimates did not indicate any statistically significant differences between the groups in changes in competence need satisfaction ($p > 0.05$). Thus, H2 (i.e., *that competence need satisfaction would not change across the retirement transition*) was also supported.

None of the four groups showed statistically significant changes in relatedness need satisfaction across the three waves (Table 2) and no statistically significant differences between the groups were found in the slope estimates ($p > 0.05$). Thus, H3 (i.e., *that relatedness need satisfaction would increase across the retirement transition*) was not supported.

We also examined changes in global need satisfaction by estimating a FOCUS model where a second-order intercept and slope factor were specified to examine whether a higher-order factor structure (i.e., global need satisfaction) drives the relation among the developmental trajectories of the constructs at the first level (i.e., autonomy, competence, and relatedness). The model fit of the unconditional FOCUS model was, $\chi^2(301) = 1105.480$, $p < 0.001$, CFI = 0.960, TLI = 0.953, RMSEA = 0.032, 90% CI [0.030, 0.034], SRMR = 0.041. The slope mean was positive and statistically significant (0.041, $p < 0.001$), whereas the slope variance was not statistically significant (0.009, $p = 0.086$), indicating a relatively homogenous average

Table 3 Intercept and slope estimates from the multigroup LGCMs of depressive symptoms

	Working	Constantly Retired	Retired W2	Retired W3
Intercept mean	0.505*	0.427*	0.440*	0.526*
Slope mean	-0.005	0.000	0.001	-0.035*
Intercept variance	0.131*	0.109*	0.132*	0.125*
Slope variance	0.001	0.001	0.014	0.001
Intercept-slope covariance	-0.005	0.003	-0.007	-0.007
Intercept-slope correlation	-0.451	0.270	-0.162	-0.571

* $p < .05$

increase in global need satisfaction in the sample across the three waves. We included two dummy coded predictors representing retirement status. In the first dummy variable workers were coded as 1 and in the other dummy coded variable the constantly retired group was coded as 1. The retired W2 and retired W3 groups were combined into one group and used as reference group (i.e., coded as 0).¹ Hence, the first dummy coded predictor compared the workers with those retiring between W1 and W2 or between W2 and W3 and the second dummy coded predictor compared the constantly retired group with those retiring between W1 and W2 or between W2 and W3. Including the dummy coded predictors of the second-order intercept and slope factors showed that the constantly retired group’s intercept was higher compared to the retired W2 and retired W3 group ($B = 0.210, p < 0.001$), whereas no statistically significant difference was found between the intercept of the workers and the retired W2 and retired W3 group ($B = 0.022, p < 0.489$). The workers ($B = -0.078, p < 0.001$) and the constantly retired group ($B = -0.093, p < 0.001$) had a lesser increase in the slope compared to the retired W2 and retired W3 group.

For depressive symptoms, there were relatively small changes across the working, constantly retired, and retired W2 groups (see Tables 3 and 4). The retired W3 group, however, reported a statistically significant decrease in depressive symptoms (slope mean = -0.035, $p = 0.006$). The decrease in depressive symptoms in the retired W3 group was larger than the working and constantly retired groups ($p < 0.05$). To summarize, the retired W2 and retired W3 groups increased more in global need satisfaction across the three waves compared to workers and the constantly retired

¹ We combined the retired W2 and retired W3 groups as their levels of and changes in need satisfaction and their effects on the second-order intercept and slope factors were identical. Hence, we reduced the dummy coded predictors to two instead of three to simplify the model.

Table 4 Latent mean differences in basic psychological needs and depressive symptoms

	Working	Constantly Retired	Retired W2	Retired W3
Autonomy				
W1	3.752	4.055	3.785	3.714
W2	3.745	4.072	4.057	3.721
W3	3.797	4.041	4.039	4.031
Competence				
W1	3.994	3.904	3.858	3.874
W2	4.006	3.946	3.919	3.886
W3	4.063	3.936	3.923	3.927
Relatedness				
W1	4.480	4.541	4.448	4.479
W2	4.439	4.565	4.531	4.491
W3	4.457	4.551	4.529	4.521
Depressive symptoms				
W1	0.481	0.405	0.422	0.493
W2	0.475	0.399	0.403	0.488
W3	0.471	0.404	0.421	0.422

W1 wave 1, W2 wave 2, W3 wave 3

group. However, when examining the three needs separately we observed that autonomy need satisfaction displayed the largest change (i.e., increase) of the three needs in the retired W2 and retired W3 groups (supporting H1), whereas competence and relatedness need satisfaction remained stable across the retirement transition (supporting H2, but not H3, respectively). Workers showed a slight increase in autonomy and competence need satisfaction across the three waves, whereas the constantly retired group did not show any significant changes in need satisfaction across the three waves. A decrease in depressive symptoms was observed in the retired W3 group, whereas the other three groups showed stable levels of depressive symptoms over time.

Need satisfaction and depressive symptoms

Model fit of the adjusted multivariate LGCMs are shown in Table 1 and the results from the multivariate LGCM are displayed in Table 5. A consistent negative relation was found between all three needs and depressive symptoms at the between- and within-person level, which is consistent with H4 (i.e., *that higher levels of need satisfaction would be related to less depressive symptoms at the between- and within-person level*). The only exception was the within-person level relation between relatedness need satisfaction and depressive symptoms in the retired W2 group, but although the relation was weaker in magnitude, it was still in the expected direction. Hence, experiencing higher need satisfaction was related to less depressive symptoms at baseline.

Table 5 Parameter estimates (unstandardized estimates) from the multivariate LGCMs

	Working	Retired	Retired W2	Retired W3
$\alpha_{\text{autonomy}} \rightarrow \beta_{\text{depressive symptoms}}$	–0.011	–0.049	–0.039	–0.071
$\alpha_{\text{depressive symptoms}} \rightarrow \beta_{\text{autonomy}}$	–0.100	–0.037	–0.257	–0.074
$\alpha_{\text{autonomy}} \leftrightarrow \alpha_{\text{depressive symptoms}}$	–0.059*	–0.049*	–0.055*	–0.047*
$\beta_{\text{depressive symptoms}} \leftrightarrow \beta_{\text{autonomy}}$	–0.002	0 ^a	0 ^a	0 ^a
$WP_{\text{depressive symptoms}} \leftrightarrow WP_{\text{autonomy}}$	–0.019*	–0.017*	–0.018*	–0.039*
$\alpha_{\text{competence}} \rightarrow \beta_{\text{depressive symptoms}}$	0.004	–0.011	0.004	0.056
$\alpha_{\text{depressive symptoms}} \rightarrow \beta_{\text{competence}}$	0.007	0.029	–0.019	–0.017
$\alpha_{\text{competence}} \leftrightarrow \alpha_{\text{depressive symptoms}}$	–0.052*	–0.039*	–0.052*	–0.071*
$\beta_{\text{depressive symptoms}} \leftrightarrow \beta_{\text{competence}}$	0 ^a	0 ^a	0 ^a	0 ^a
$WP_{\text{depressive symptoms}} \leftrightarrow WP_{\text{competence}}$	0.012*	–0.015*	–0.022*	–0.030*
$\alpha_{\text{relatedness}} \rightarrow \beta_{\text{depressive symptoms}}$	–0.012	–0.036	0.058	–0.015
$\alpha_{\text{depressive symptoms}} \rightarrow \beta_{\text{relatedness}}$	–0.085*	–0.033	–0.068	–0.052
$\alpha_{\text{relatedness}} \leftrightarrow \alpha_{\text{depressive symptoms}}$	–0.042*	–0.034*	–0.038*	–0.029*
$\beta_{\text{depressive symptoms}} \leftrightarrow \beta_{\text{relatedness}}$	0 ^a	0 ^a	–0.002	0 ^a
$WP_{\text{depressive symptoms}} \leftrightarrow WP_{\text{relatedness}}$	–0.012*	–0.011*	–0.006	–0.016*

Control variables in all of these models were age, years of education, sex, civil status, leisure activities, self-rated health, income satisfaction, and control over retirement (not in the working group)

α intercept, β slope, WP within-person

^avariances and covariances set to 0 to avoid inadmissible solutions

* $p < .05$

In addition, the within-person level relations indicate that when need satisfaction was higher than usual at a specific time point, participants also reported less depressive symptoms at that specific time point.

To avoid estimation problems and inadmissible solutions (e.g., negative variances), most of the slope variances and covariances had to be set to 0, which prohibited us to examine H5 (i.e., *that increases in need satisfaction across the retirement transition would be related to decreases in depressive symptoms*). Furthermore, none of the intercept-slope predictions were statistically significant in the retired W2 or retired W3 groups, thus H6 (i.e., *that higher pre-retirement levels of need satisfaction would be related to decreases in depressive symptoms across retirement*) was not supported. However, we noted that higher baseline levels of depressive symptoms predicted decreases in relatedness need satisfaction across the study period in the working group.

Discussion

Despite an increased interest in the continuity and change in well-being across the transition to retirement (e.g., Henning et al. 2016), little is known about changes in need satisfaction from pre- to post-retirement and how need satisfaction across the transition to retirement is related to psychological well-being. The current study was guided by the SDT (Ryan and Deci 2017), and we specifically investigated if

need satisfaction was related to depressive symptoms across the retirement transition.

Changes in need satisfaction across retirement

Our results confirm that there is an initial increase in autonomy across the retirement transition in line with the honeymoon effect (Atchley 1976; Lindwall et al. 2017), hence, H1 was supported. Notably, this is only a short-term increase from pre- to postretirement, and it does not continue into post-retirement life. The increase in perceived autonomy in the retired W2 and retired W3 groups is likely a reflection of an increased freedom, more time to pursue intrinsically motivating goals, and less constraints and demands associated with previous work-life (e.g., work hours, responsibilities; Sheldon and Kasser 2001). An increase in autonomy also seems to begin a few years before the actual retirement event. Interestingly, people in the working group reported lower levels of autonomy compared to the retired W2 and retired W3 groups, but they showed a significant increase in autonomy as they came closer to retirement. This is in line with Shultz and Wang (2011) notion that within the general retirement transition there are smaller and shorter segments of more specific transitions that individuals experience when approaching retirement. For example, planning for retirement, transitioning through the retirement decision-making process, beginning life as a self-designated retiree, and finally becoming settled as a fully retired person. Our findings suggest that changes related to the retirement transition

might occur many years before people in fact leave a full-time working life (Ekerdt 2010).

In line with our hypothesis (H2), we did not observe any changes in perceived competence across the retirement transition. Neither did we observe any changes in relatedness, which is in contrast to H3. The satisfaction of these two basic psychological needs remained relatively high and stable over the study period. Other factors, such as family, friends, and leisure activities, may contribute to a general sense of competence and relatedness among people across the retirement transition. It is also likely that peoples' sense of competence postretirement, at least partly, is based on preretirement work experiences. In that respect, retirement will unlikely influence competence need satisfaction in the first years of retirement (Henning et al. 2019b). Furthermore, as postulated by the motivational theory of life-span development, it may be that the participants were more focused on maintaining or avoiding decline in competence (Heckhausen et al. 2010), which makes increases in competence need satisfaction less likely across the retirement transition. That we did not observe changes in relatedness need satisfaction might be related to the relatively short time frame of the current study. Having a longer follow-up time after retirement would be more in line with the predictions of the socioemotional selectivity theory (Carstensen 1995) because people would have had more time to pursue emotionally rewarding experiences and intrinsically motivated goals that satisfies the need for relatedness.

An increase in perceived competence was found in the working group, which indicate that work may contribute to a general sense of competence. According to the postulates of the motivational theory of life-span development (Heckhausen et al. 2010), such increases could reflect an increased use of selective secondary control strategies among older workers. As people age, there is a shift towards relying more on secondary control strategies to minimize losses, to maintain, and expand existing levels of primary control (Heckhausen et al. 2019). A greater reliance on secondary control strategies in older workers can amplify preferences for and increase salience of intrinsically rewarding features of the job, such as enjoyment and achievement (Kooij et al. 2011).

Noteworthy, we observed a general increase in global need satisfaction across the retirement transition that was larger in the retired W2 and retired W3 groups compared to the workers and the constantly retired group. This increase, however, seems to be largely driven by increases in autonomy need satisfaction. Hence, our results demonstrate that not all three needs changes across the retirement transition, which highlights the importance of assessing the needs separately in the context of the retirement transition. This is also in line with recent meta-analytic findings showing that the needs are not interchangeable, cannot compensate for each other in an overall need satisfaction scale, and are unlikely

to always co-occur (Van den Broeck et al. 2016). Combining the three needs into an overall need satisfaction measure also runs contrary to SDTs conceptualization that the three basic needs represent separate and non-compensatory entities (Van den Broeck et al. 2016).

It is also important to mention that the participants in the HEARTS study (on average) are well educated and appears to be relatively healthy. Although we observed some changes in need satisfaction and depressive symptoms, many of the observed changes were small. The relative stability in health and well-being of the participants from pre- to post-retirement is in line with continuity theory (Atchley 1999), which emphasizes consistency of life patterns over time. Atchley (1999) argued that there is a considerable internal (e.g., attitudes, personal goals, identity, and self-concept) and external continuity (e.g., leisure activities, social relationships) over the retirement transition that contributes to the individual's retirement adjustment. Hence, people who maintain their general life patterns and need satisfying activities are not likely to experience a significant drop in well-being when transitioning from work to retirement (Henning et al. 2016). Similar ideas have been proposed in the SDT literature. For example, Moller et al. (2010) proposed that a history of need satisfaction might increase peoples' sensitivity and receptiveness toward new opportunities for need satisfaction. This idea of sensitization and desensitization of need satisfying experiences aligns well with continuity theory and may explain why we observe a relatively high degree of stability of need satisfaction across the transition to retirement.

Need satisfaction and depressive symptoms

Consistent with our expectations, we observed a consistent pattern across the groups suggesting that people who reported higher levels of need satisfaction at baseline also reported lower depressive symptoms at baseline. These cross-sectional relations between need satisfaction and depressive symptoms were generally in line with previous studies (e.g., Mackenzie et al. 2018; Ng et al. 2012) and supports the tenets of SDT that satisfaction of the basic psychological needs is related to better well-being and functioning (Ryan and Deci 2017).

We also observed a consistent pattern of within-person relations between need satisfaction and depressive symptoms suggesting that at measurement points where individuals experienced higher need satisfaction than usual (i.e., compared to their own mean trajectory), they also experienced less depressive symptoms. This pattern was evident for all three basic psychological needs; however, the magnitude was generally larger for autonomy and competence compared to relatedness. Although the relation between need satisfaction and depressive symptoms at the between-person

level is well-documented in the SDT literature (cf. Ng et al. 2012), less is known about the within-person relation between need satisfaction and depressive symptoms. Previous studies focusing on within-person level analyses show that higher need satisfaction than usual is linked to higher life satisfaction (Neubauer et al. 2017) and psychological adjustment (Martin et al. 2019) than usual in older adults, and to a indicators of well-being in university students (La Guardia et al. 2000; Neubauer and Voss 2018). Findings from the current study expands our knowledge on the within-person relation between need satisfaction and depressive symptoms and suggest that continuous support for the basic psychological needs may help reduce depressive symptoms across the retirement transition.

Due to inadmissible solutions (i.e., negative [residual] variances or correlations larger than 1.0) we were unable to estimate slope-slope correlations and examine whether increases in need satisfaction was related to decreases in depressive symptoms across the retirement transition. In contrast to our hypothesis (H6), we did not observe any statistically significant effects of pre-retirement need satisfaction on subsequent changes in depressive symptoms (or vice versa) across the retirement transition. We are aware of one previous study that examined the relation between baseline need satisfaction and changes in depressive symptoms (Custers et al. 2014). However, the sample in that study was older (79.9 years at baseline) compared to the HEARTS sample, the participants were admitted to a home for physically frail (the HEARTS sample is well-educated and relatively healthy), and the follow-up period was only 8 months (compared to 1 year between waves in HEARTS). Given these differences in design and sample, it is not surprising that we observed slightly different results in the current study. However, it is worth mentioning that even though we did not observe any statistically significant effects, the parameter estimates were mostly in the expected direction, particularly for autonomy and competence. The only statistically significant effect we observed was in the working group where higher baseline levels of depressive symptoms predicted a decrease in relatedness need satisfaction across the study period. It is well known that higher levels of depressive symptoms is associated with social isolation and reduced social connectedness (Cruwys et al. 2014), thus these results partly confirm what is known from previous research. Although the effect only was statistically significant in the working group, we observed a similar tendency of negative relations in the other groups as well, albeit these effects were slightly smaller in magnitude. That the effect was statistically significant in the working group might also be a power issue; the working group was the largest group ($n = 1282$) and thus might have had the highest power to detect effects.

Finally, it might be that the slope-slope associations and intercept-slope predictions require a more fine-grained measurement scheme than the measurements used in the present study (i.e., once a year). Hence, to better understand changes in need satisfaction and depressive symptoms, more frequent measurements might be needed (e.g., a measurement-burst design; Sliwinski 2008). Furthermore, the 4- and 5-point response scales used in the current study do provide constraints on the variability in these variables, which needs to be taken into consideration when interpreting these findings.

Limitations and future research

Despite several strengths, such as a large sample, longitudinal data, and having relatively large subgroups of participants with different retirement status there are limitations of the current study. First, we relied on an abbreviated version of the BPNSFS (Chen et al. 2015) and we were therefore unable to examine need satisfaction and need thwarting. If changes in need satisfaction and need thwarting represents two separate processes and are linked to different antecedents and outcomes across the retirement transition would be an interesting avenue to explore in future research (cf. Vansteenkiste and Ryan 2013).

Second, we relied on a multi-group approach and compared changes and associations in groups with different retirement status on a yearly basis. As such, we could not examine what happens in the time leading up to or what happens in the time just after the retirement event. An intensive longitudinal design, such as a measurement-burst design (Sliwinski 2008), would aid our understanding of short- and long-term changes associated with the transition to retirement.

Third, need satisfaction is largely influenced by various factors in our social environment. It would thus be interesting to make a distinction between different life spheres, such as work, family, friends, and romantic relationship and examine their relative contribution to need satisfaction across the retirement transition. The concept of interdependent life spheres is also emphasized within the life-course perspective of retirement adjustment (Wang et al. 2011). Within this life-course perspective it is suggested that nonwork life spheres are important for retirement adjustment because they provide retirees with alternative salient identities and offer opportunities for retirees to engage in meaningful (and need satisfying) activities after retirement (Hutchison 2018).

Fourth, all of the measures included in the current study were based on self-reports and thus represents the participants perception of their need satisfaction and psychological well-being. Future research should explore other indicators of well-being (e.g., cognitive, mental, and physical), and

could for example include objective assessments of cognitive and physical functioning and clinician-diagnosed depression to further our understanding of the link between need satisfaction and well-being across the retirement transition.

Finally, it is also important to interpret the results within the current retirement system in Sweden, the Swedish population of retirement-aged individuals, and the characteristics of the sample in the HEARTS study. Whether similar findings would be observed in sample from countries with different retirement systems or in samples with different characteristics (e.g., samples with lower education) are interesting avenues for future research.

Conclusions

Grounded in SDT, this study is the first to examine changes in need satisfaction and how need satisfaction is related to depressive symptoms across the retirement transition. The observed changes in autonomy need satisfaction in the retired W2 and retired W3 groups and the changes in autonomy and competence need satisfaction in the working group highlights a need to better understand, not only changes across retirement, but also factors that contribute to need satisfaction in the years leading up to retirement. Thus, our findings indicate that a longer time perspective is warranted to better understand the relative importance of need satisfaction before, during, and after the retirement event. Our results also suggest that need satisfaction and depressive symptoms are related, not only at the between-person level (i.e., intercept-intercept relations), but also at the within-person level, indicating that higher than usual need satisfaction at a specific time point is related to lower than usual depressive symptoms. Although pre-retirement levels of need satisfaction did not have a statistically significant effect on long-term change in depressive symptoms across the retirement transition, the within-person relations suggest that continuous support for the basic psychological needs may help reduce depressive symptoms in retirement-aged adults and calls for more fine-grained measurements of the relation between need satisfaction and depressive symptoms.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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