The Longitudinal Impact of a Chronic Physical Health Condition on Subjective Well-being

Caroline Debnar[1,2,3], Valerie Carrard[1,2,3], Davide Morselli[3], Gisela Michel[2], Nicole Bachmann[4], Claudio Peter[1,2,3]

[1]Swiss Paraplegic Research (SPF), Nottwil, Switzerland

[2]Department of Health Sciences and Medicine, University of Lucerne

[3]Swiss Centre of Expertise in Life Course Research LIVES, University of Lausanne

[4]University of Applied Sciences and Arts Northwestern Switzerland

Author Note

Caroline Debar https://orcid.org/0000-0003-2346-621X

Valerie Carrard https://orcid.org/0000-0001-7355-9567

Davide Morselli https://orcid.org/0000-0002-1490-9691

Gisela Michel https://orcid.org/0000-0002-9589-0928

Nicole Bachmann https://orcid.org/0000-0001-8760-9027

Claudio Peter https://orcid.org/0000-0001-9713-3210

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Correspondence concerning this article should be addressed to Caroline Debnar, Swiss Paraplegic Research, Guido A. Zäch-Strasse 4, CH-6207 Nottwil, Switzerland. E-mail: caroline.debnar@paraplegie.ch

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Abstract

Objective: Chronic health conditions (CHC) can have severe impacts on an individual's life, affecting well-being and mental health. Nonetheless, individuals can show different response patterns of psychological adaptation following a CHC onset. This study aimed to identify profiles of subjective well-being (SWB) at one year before (T-1), one year after (T+1), and four years after (T+4) the onset of a physical CHC using seven indicators (health satisfaction, life satisfaction, energy, joy, worry, sadness, anger), examine transitions between the identified profiles, and determine predicting factors of these transitions. ***Method:*** Latent profile analysis and latent transition analysis was conducted using a sample of 357 participants reporting a physical CHC drawn from the Swiss Household Panel dataset. ***Results:*** Three profiles were identified at T-1: *low*, *high*, and *very high* SWB. At T+1 and T+4, a fourth *vulnerable* profile emerged. Transition analysis showed that, overall, the most probable transition was to stay in similar profiles across time. However, recovery towards higher SWB profiles and delayed reaction towards lower SWB profiles appeared between one and four years following the CHC onset. Factors predicting recovery patterns from *low* to *high* SWB are better health status, fewer negative life events, and financial scarcity, whereas lower emotional stability was related to a delayed reaction from *high* to *low* SWB. ***Conclusion:*** This study underlines the importance of personal factors in the adaptation following CHC onset. Routine assessment of personality traits would enable identifying individuals at greater risk of lower SWB following the onset of a CHC.

Keywords: personality, chronic disease, psychological adaptation, subjective well-being, latent transition analysis.

The Longitudinal Impact of a Chronic Physical Health Condition on Subjective Well-being

The steadily rising prevalence of chronic physical health conditions (CHC) is linked to several risk factors such as disadvantageous health behaviors, environmental pollution, and an increasingly aging population (IHME, 2018). Physical CHCs are defined as health problems persisting for a prolonged period – such as arthritis, cardiovascular diseases, cancer, and diabetes (WHO, 2019). The onset of a physical CHC can go hand in hand with psychological comorbidities, and people have to psychologically adapt to their health condition (Livneh, 2001). Psychological adaptation refers to the multidimensional and temporal process fostering mental and emotional balance in response to adversity, such as the onset of a CHC. Psychological adaptation models, such as the Psychosocial Adaptation to Chronic Illness and Disability model (Livneh, 2001), assume that the onset of a CHC will have differential impact on psychological outcomes such as life satisfaction, mental health, or other indicators of well-being. Even though each physical CHC has distinct symptomology, affected individuals are often faced with similar strains, such as long-term engagement, self-management, or impacts on well-being (Scharn et al., 2019). Thus, it has been proposed that studying psychological adaptation in a sample across different types of physical CHC would enable drawing more general conclusions on the impact of CHCs on mental health (Van Leeuwen et al., 2012). Nevertheless, so far, studies focused exclusively on one single type of CHC.

Historically, psychological adaptation has been first studied in terms of post-traumatic stress disorder or other psychiatric symptoms. However, the presence of negative symptoms does not necessarily imply an absence of positive affect or negative evaluation of one's life and vice versa. For example, research focusing on bereavement has shown that individuals may have a negative evaluation of their own life or experience low positive affectivity without displaying increased levels of distress. Consequently, the study of psychological adaptation needs a multidimensional assessment across a range of positive and negative indicators (Infurna & Luthar, 2018). A multidimensional way of empirically defining psychological adaptation outcomes is subjective well-being (SWB). Diener's tripartite SWB model includes a positive cognitive evaluation of life overall (i.e., global life satisfaction) or specific life domains (e.g., health satisfaction), the presence of positive affect (e.g., feelings of joy), and the absence of negative affect (e.g., feelings of sadness; Diener, 1984). Studies using multidimensional indicators of psychological adaptation following physical CHC identified different patterns of mental health or well-being following myocardial infarction

(Martens et al., 2007), rheumatoid arthritis (Morris et al., 2011), or spinal cord injury (Aparicio et al., 2020). These studies used cluster or profile analyses to identify subgroups of individuals sharing similar patterns across different indicators. Their results indicate three to four different patterns of psychological adaptation, such as "Non-depressed" (Morris et al., 2011), "low positive affect" (Martens et al., 2007), or "minimal impact" (Aparicio et al., 2020). Nevertheless, these profile studies are limited by their cross-sectional design.

In this regard, another important aspect of psychological adaptation is its temporality. Psychological adaptation is a more or less long-lasting process unfolding through several years (Galatzer-Levy et al., 2018). Past studies investigating longitudinal trajectories shed light on heterogeneous patterns, such as recovery or delayed reaction, to the CHC onset that could not be detected with cross-sectional design (Debnar et al., 2020; Galatzer-Levy et al., 2018). Latent transition analysis (LTA) is a statistical technique that enables, not only to identify patterns or profiles of response across multiple indicators of psychological adaptation but also their longitudinal unfolding. After identifying profiles of psychological adaptation at several time points, LTA enables determining the probability of each individual staying in the same profile or change to any other profile from one-time point to the other. For instance, a study on spousal bereavement by (Bennett et al., 2019) identified three psychological adaptation profiles - vulnerable (7%), coper (39%), and resilient (54%) - across five well-being measures: depression, hopelessness, loneliness, life satisfaction, and subjective health. The results of an LTA then showed that most of the individuals stayed in the same profile across the two years following bereavement, with few participants changing to another profile. The use of LTA has thus the potential to shed light on the heterogeneity of the psychological adaptation process as well as its temporal unfolding and predicting factors.

Several theoretical models, including the spinal cord injury adjustment model (Middleton & Craig, 2008), the model of psychosocial adaptation to chronic illness and disability (Livneh, 2001), or the coping with chronic disease model (Maes et al., 1996), conceptualize the predicting factors influencing the psychological adaptation following the onset of a CHC. These factors include biological (e.g., health status), psychological (e.g., personality), social (e.g., social support), or sociodemographic (e.g., age) aspects. Empirical studies have shown that factors associated with better mental health or well-being following the onset of a physical CHC are: better health such as overall better health status (Burton et al., 2015), or better self-rated health (Zhu et al., 2014), higher emotional stability, openness, extraversion, conscientiousness (Hampson & Friedman, 2008; Strickhouser et al., 2017), more social support (Debnar et al., 2020; Li et al., 2018), and more spirituality (Harris et al.,

2010). On the other hand, factors such as income (Lyons et al., 2016), past negative life events (Butler et al., 1999), civil status (Havik, 1990; Moergeli et al., 2012), education (Morris et al., 2011; Van Leeuwen et al., 2012), sex (Moergeli et al., 2012; Zhu et al., 2014), and age (Havik, 1990; Moergeli et al., 2012) have been inconsistently associated with psychological adaptation following a physical CHC.

The objective of the present study was to describe the multidimensional and longitudinal process of psychological adaptation following different types of physical CHC with the inclusion of pre-event data in a non-clinical population. The first aim was to identify the number and type of psychological adaptation profiles one year before, one year after, and four years after the onset of a physical non-congenital CHC. Studies exploring psychological adaption identified three to four heterogeneous profiles with varying levels of mental health or well-being following the onset of a CHC (Aparicio et al., 2020; Martens et al., 2007; Morris et al., 2011). For instance, (Martens et al., 2007) reported three profiles of SWB following myocardial infarction. Including one profile characterized by the absence of negative affect and the presence of positive affect, a second profile characterized by low positive affect and absence of negative affect, and the third characterized by a relative absence of positive affect and the presence of negative affect. Based on the research conducted in other countries, it was expected to identify three to four profiles with varying psychological impact levels. The second aim was to explore the probability of transition between the profiles identified in each of the three time-points. In line with literature about trajectories following adversity, it was expected to identify three to five transition patterns, including a stable high, recovery, and stable low transition (Galatzer-Levy et al., 2018). Finally, the third aim of the study was to identify which health-related, psychological, social, and demographic factors predict the transition between one and four years after the onset of the CHC. Based on the literature reviewed above, it was hypothesized that better health (Burton et al., 2015; Zhu et al., 2014), higher emotional stability (Hampson & Friedman, 2008; Strickhouser et al., 2017), more social support (Debnar et al., 2020; Li et al., 2018), higher sense of spirituality (Harris et al., 2010), and less financial scarcity (Lyons et al., 2016) would increase the probability of better psychological adaptation. Further, it was expected that profile transition is not predicted by age, sex, civil status, or education (Moergeli et al., 2012; Morris et al., 2011).

Method

Study Design, Data Source and Sample

This longitudinal study investigated the transition between SWB profiles at one year before (T-1), one year after (T+1), and four years after (T+4) the onset of a physical CHC. A diagram of the model design is available online as supplementary materials (Figure S1). This is a secondary analysis of data drawn from the waves 2007-2015 of the Swiss Household Panel (SHP). The SHP is a nationally representative yearly panel study following a random sample of Swiss private households and their individuals aged 14 or older. Data has been collected annually since 1999 (Voorpostel et al., 2018 for further information concerning the study and its sampling procedures). Participants from the SHP 2013 wave who indicated the presence of a "chronic (long-standing) illness or condition (health problem)" self-reported as a "physical problem" and having started between 2009 and 2011 (T0) were considered for the present study. Exclusion criteria were congenital causes of the CHC. The exact items used to select the present study SHP sample are available online as supplementary materials (Table S2).

Measures

SWB indicators

Seven indicators of SWB, as defined by Diener (1984), were selected from the SHP dataset. They have been assessed at T-1, T+1, and T+4. Cognitive evaluation of life was measured with two items from the WHOQOL inventory (1998): *health satisfaction* ("How satisfied are you with your state of health, if 0 means "not at all satisfied" and 10 "completely satisfied?") and *life satisfaction* ("In general, how satisfied are you with your life if 0 means "not at all satisfied" and 10 means "completely satisfied"?"). The presence of positive affect was measured with two items: frequency of *energy* ("Are you often plenty of strength, energy, and optimism, if 0 means "never" and 10 "always"?") meant to measure the vitality subscale of the SF-36 inventory (Ware, 1999) and *joy* ("How frequently do you generally experience joy, if 0 means "never" and 10 "always"?"). The absence of negative affect was measured with the frequency of each of the following three negative emotions: *worry*, *sadness*, and *anger* ("How frequently do you generally experience the following emotion, if 0 means "never" and 10 "always"?"). The items *joy*, *worry*, *sadness*, and *anger* were selected to measure the so-called basic emotions (Ekman, 1992; Shaver et al., 1987).

Predicting factors

Health-related factors. In order to capture the influence of the CHC's symptoms three health-related factors were measured one year after the onset (T+1): *health status* ("We are now going to talk about various aspects of your health: how do you feel right now?"; 1 = "very well"; 5 = "not well at all"), *health impediment* ("Please tell me to what extent, generally, your health is an impediment in your everyday activities, in your housework, your

work or leisure activities ? 0 means "not at all" and 10 "a great deal."), and *improvement in health* ("Since last year, has your health improved or worsened if 0 means "greatly worsened" and 10 "greatly improved"?").

Psychological factors. Personality was measured at the onset year (T0) with the 10-item Big Five Inventory (Rammstedt & John, 2007). Participants indicated to what extent they see themselves as someone who, for instance, "is outgoing, sociable," "is reserved," "does a thorough job," or "has artistic interests" (0 = "completely disagree"; 10 = "completely agree "). This validated questionnaire assesses five personality traits, with two items each: extraversion, emotional stability, conscientiousness, agreeableness, and openness. Given the low alpha of some personality trait, probably due to the low number of items, it was decided to only consider emotional stability and extraversion (Cronbach`s alpha > .40 see Table 1) for the present study. *Spirituality* was assessed two years before onset (T-2) with an indicator of participants' praying habits ("How frequently do you pray apart from at church or within a religious community?"; 1 = "never" to 5 = "daily or almost daily"). The *number of past negative life event* was measured by summing the number of time the participants indicated having experienced one of the following adverse life events between 2007 and 2015 (T-2 and T+4): "illness, accident of closely related person", "death of closely related person", "termination of close relationship", "dismissal, unemployment", "financial difficulties", "material damage", and "psychological trauma".

Social factors. *Relationship satisfaction* and *social contacts* were assessed one year before onset (T-1). *Relationship satisfaction* was measured with the single variable: "How satisfied are you with your personal, social, and family relationships, if 0 means "not at all satisfied" and 10 "completely satisfied"?"). *Social contact* is an aggregation of the number ("With how many […] are you on good terms and enjoy a close relationship?") and the frequency of contacts ("How frequent are your contacts with them?") with close friends, relatives, neighbors, and colleagues separately.

Sociodemographic factors. Five sociodemographic characteristics assessed one year before onset (T-1) were included: *partnership status* (having a partner or not), *education* (years of education based on International Standard Classification of Education; Schneider, 2013), *occupation* (paid work or not), *financial scarcity* ("If you consider the total of your household's income and expenses, would you say that currently your household: 1 = can save money; 2 = spends what it earns; 3 = eats into its assets and savings; 4 = gets into debt?"), *sex* (man or woman), and *age*.

Analysis

In order to identify SWB profiles at T-1, T+1, and T+4, exploratory latent profile analysis (LPA) across the seven SWB indicators were performed for each time point. LPA is a person-centered approach that identifies subgroups of individuals with similar responses on a set of variables. In contrast to commonly used variable-centered cluster analyses such as factor analyses, LPA accounts for classification error and uncertainty, leading to a more precise estimation of the class membership. A more detailed description of applications and recent developments in LPA was published elsewhere (Collins & Lanza, 2009). For T-1, two to five profiles were iteratively tested via maximum likelihood estimation with robust standard error. The best-fitting number of profiles was identified by comparing goodness of fit indices: the Bayesian Information Criterion (BIC; smaller number is preferable), the Bootstrap Likelihood Ratio Test (BLRT; non-significance indicates that the model with one less profile is better), entropy (high values > .80 indicate a high certainty of classification; Nylund, 2007), sample size per profile (profile sample size > 5% of the overall sample size), and interpretability of the profile parameters (based on past literature and theoretical meaningfulness). The best fitting profiles of T-1 were then considered as the baseline profiles and held constant (by fixing their indicators' means) in the analyses of the two other time points (T+1 and T+4). This common procedure ensures that the profiles have the same configuration and the same interpretation across the three-time points and facilitates interpretation of transitions between profiles (Bennett et al., 2019). However, to enable the identification of heterogeneous profiles appearing after the onset of the CHC, new freely estimated profiles were allowed to emerge at T+1 and T+4. For these post-event time points, an iterative process, starting from the fixed three baseline profiles, was applied to test increasing numbers of subgroup profiles until the best-fitting model was acquired using the same goodness of fit indices as for T-1.

The transition between the profiles identified at each of the three-time points was then tested using LTA. To reliably transfer the parameter estimates of the identified profiles, random start values of the LTA were set equal to the maximum likelihood estimates of the previously conducted LPAs. LTA computes the probability of staying in the same profile or move between one profile to another from one-time point to the next while accounting for misclassification errors (Nylund, 2007). These probabilities represent the likelihood of each individual presenting profile X at a certain time point to present a profile Y at the following time point. They vary between 0 (no likelihood to go from profile X to profile Y) and 1 (maximum certainty to go from profile X to profile Y). In the case of multiple profiles at each time point, these probabilities are not easy to grasp because they represent likelihood for each specific profile separately. Thus, for clarity's sake, the results will be presented in terms of

number of individuals showing the specific transitions. A transition probability of .50 between profile X and Y will thus be translated into N = 30 if the number of individuals (based on estimated posterior probabilities) is N = 60 for profile X. Transition probabilities were allowed to be freely estimated.

Finally, to test which predicting factor relates to the transition probabilities between T+1 and T+4 an ANOVA version of a manual 3-step approach was used. This approach estimates the LPA and LTA models, computes the misclassification error rate, and use ANOVAs to test mean differences of predicting factors between the different transition patterns directly in the LTA model while adjusting for misclassification errors. This procedure has the advantage of identifying unequal means across profile transition, is particularly suitable for small sample size profiles, and it appears to be more resistant to shifts in the latent profile membership from Step 1 to Step 3 (Nylund-Gibson et al., 2019; Nylund-Gibson et al., 2014). To ensure that model results did not depend on local maxima, every final model was rerun with at least twice the random starts (default used = 10 2; maximum tested = 800 80). Incomplete data for the SWB indicators were estimated using full information maximum likelihood, and missing values in the predictor variables were imputed using multiple imputations at the mean level (20 imputed datasets). Analyses were performed with Mplus version 8, and the analysis syntaxes are available online as supplementary material (Mplus syntax S3-S6).

Results

Descriptive

In total, 356 (204 women and 152 men) participants of the SHP, indicating the presence of a physical non-congenital CHC having started between 2009 and 2011, were included in the present study. One year before the onset participants mean age was 54 years (SD = 18.04), 77.97% of the participants reported having a partner, and the average years of education was 13.24 (SD = 3.32). Further, descriptive statistics of the total sample are provided in Table 1. Due to non-participation in some waves, there was a variation in the sample size per time-point: N = 276 one year before, N = 325 one year after, and N = 334 four years after the CHC onset. Skewness and kurtosis coefficients indicated that the SWB indicators were non-normally distributed (range = - 1.20 – 0.93 and 2.64 – 8.73 for skewness and kurtosis respectively). Robust maximum likelihood estimation was thus used to withstand the non-normal distribution of the data (Muthén & Muthén, 2010). Correlations between the predictor variables are available online as supplementary materials (Table S6).

Profiles of SWB

At one year before the onset (T-1), the fit indices indicated that a 4-profile solution should be selected (see Table 2). However, the 4-profile solution showed a very similar BIC index compared to the 3-profile solution and did not add any new information (the added, fourth profile was very similar to another one). Consequently, the final solution adopted for T-1was a 3-profile model, including a *very high*, *high*, and *low SWB* profile (see Figure 1.A). The least frequent profile (14.08%) was labeled "*very high SWB*" because the individuals of this profile displayed outstanding high levels of satisfaction with health and life, positive affects, and an outstanding low level of negative affects. The *high SWB* profile was the one displayed by the majority of the T-1 sample (44.99%). It was characterized by a high level of satisfaction with health and life satisfaction, positive affect, and moderate negative affect. The *low SWB* profile (40.93%) featured low satisfaction with health and life satisfaction, low positive affect, and elevated negative affect.

At one year after the onset (T+1), fit indices indicated that a 4-profile solution best represents the data (see Table 2). As displayed in Figure 1.B, a fourth *vulnerable* profile (8.52%) emerged on top of the three baseline profiles: *very high* (8.39%), *high* (37.42%), and *low SWB* (45.72%). The emerging *vulnerable* profile was characterized by the lowest level of satisfaction with health and life and the lowest level of positive affect among all profiles. However, the individuals of the *vulnerable* profile were not the ones displaying the highest level of negative emotions. They indeed reported lower levels of negative emotion compared to the *low* SWB profile. Contrary to T-1, where the majority of the sample belonged to the *high SWB* profile, the majority of the T+1 sample displayed a *low SWB*, and the percentage of the *very high SWB* profile was lower than at T-1 (14.08% vs. 8.39%).

At four years after the onset (T+4) fit indices indicated that a similar 4-profile solution best represented the data (see Table 2) including the *very high* (4.40%), *high* (41.83%), and *low SWB* (45.45%) profiles from the baseline and a fourth *vulnerable* (8.31%) profile (see Figure 1.C). Similarly, to the T+1, profiles, the individuals of the T+4 *vulnerable* profile were the ones who displayed the lowest level of satisfaction with health and life and the lowest level of positive affect among all profiles, but not the highest level of negative emotions. The majority of the sample belonged to the *low SWB* profile, and the proportion of the *very high SWB* was even lower than at T+1 (8.39% vs. 4.40%). Another presentation of the SWB profiles with reversed scores of worry, sadness, and anger is available online as supplemental material (Figure S8).

Longitudinal Transition between Profiles of SWB

Profile transition between SWB profiles across T-1, T+1, and T+4 is represented in Figure 2. For clarity's sake, the transitions are described in terms of numbers of individuals,

but transitions probabilities are available online as supplementary materials (Supplementary Table S7). Given the relatively small number of observations, some transition cells were empty (e.g., from *vulnerable* to very *high* profile). From one year before the onset (T-1) to one year after the onset (T+1), individuals were most likely to stay in the same profile or go to a lower SWB profile after the onset of a CHC. The individuals in the *low SWB* profile had a very high probability to also display a *low SWB* profile one year after the onset (N = 100). Similarly, the individuals who showed a *high SWB* profile at T-1 were very likely to also show a *high SWB* profile at T+1 (N = 115). However, from the *very high SWB* profile at T-1, a downward transition to the *high SWB* profile (N = 14) was less likely to occur than staying in the same profile (N = 20) after the onset. From one year after the onset (T+1) to four years after the onset (T+4), the individuals in the *high* and *low SWB* profiles showed a very high probability of staying in a similar type of profile (N = 104 and N = 124 respectively). Furthermore, individuals from the *vulnerable* and the *very high SWB* profiles also showed a moderate probability of staying in a similar type of profile four years later (N = 20 and N = 17, respectively). However, more variety in profile transitions was observed from T+1 to T+4. First, an upward change (recovery pattern) was likely to occur from the *low SWB* profile at T+1 transitioning to the *high SWB* profile (N = 26) at T+4. Second, a downward change (delayed reaction pattern) was likely to occur from the *high SWB* profile at T+1 transitioning to the *low SWB* profile (N = 18) at T+4.

Predictors of Transition between T+1 and T+4 SWB Profiles

As a reminder, factors included in the predictor analysis of the recovery and delayed reaction transitions were: health status, improvement in health, health impediment, extraversion, emotional stability, number of life events, praying, relationship satisfaction, social contact, years of education, having no partner, occupation, financial scarcity, sex, and age. Given the small sample size of certain transition patterns from one year after the onset to four years after the onset, predictors were tested only for the recovery (staying in the *low SWB* profile vs upward change towards *high SWB*) and the delayed reaction (staying in a *high* SWB profile vs downward change towards *low SWB*) transitions. Individuals experiencing a delayed reaction (from *high* to *low SWB*) reported significantly lower emotional stability (M = 5.67, SD = 1.87) compared to the individuals staying in the *high SWB* profile (M = 6.85, SD = 1.75), MD = 1.17, t = 2.31, p = .021 with a medium effect size (Hedges' g = 0.67).

Regarding the individuals showing a recovery pattern (from *low* to *high SWB*), they have significantly better health status (M = 3.30, SD = 1.45) compared to the individuals staying in the *low SWB* profile (M = 2.39, SD = 0.79), MD = 0.91, t = 3.37, p = .001 with a large effect size (Hedges' g = 0.96). They also experienced fewer negative life events (M =

4.20, *SD* = 4.37) compared to the individuals staying in the *low* SWB profile (*M* = 6.37, *SD* = 6.22), *MD* = 2.17, *t* = 2.25, *p* = .024 with a medium effect size (Hedges' *g* = 0.37) and reported greater financial scarcity (*M* = 2.91, *SD* = 5.39) compared to the individuals staying in the *low* SWB profile (*M* = 1.47, *SD* = 0.68), *MD* = 1.43, *t* = 5.62, *p* < .001 with a medium effect size (Hedges' *g* = 0.61). Note that all other factors tested as predictor did not significantly relate to the recovery or delayed reaction transition.

Discussion

The purpose of the present study was to identify heterogeneous profiles of SWB at one year before (T-1), one year after (T+1), and four years after (T+4) the onset of a CHC, to explore the probability of transition between these identified profiles, and to investigate which health-related, psychological, social, and demographic factors predict these transitions. One year before the onset of a CHC three profiles of SWB were identified. Following the CHC onset, a fourth profile displaying more *vulnerable* levels of SWB emerged. Across time, the most probable transition was to stay in the same profile. However, between one and four years following the onset of CHC, more heterogeneity in the transition patterns was observed. Better health status one year after the onset, fewer negative life events, and greater financial scarcity predicted recovery patterns from *low* to *high SWB*, whereas lower emotional stability was related to a delayed reaction form *high* to *low SWB* between one and four years following a CHC onset.

Profiles of SWB and Longitudinal Transition

Analysis of pre-event data (T-1) show that before any CHC onset, people have different levels of SWB (*very high, high,* and *low SWB*) and present predominantly *high SWB* (44.98%) with a smaller proportion displaying a *very high SWB*. The present study's results then show that the onset of a physical CHC increases the risk of lower SWB. Indeed, more than half (54.97%) of the sample shows a *low SWB* or *vulnerable* profile at one year after the CHC onset. This percentage is higher than the one reported by past reviews of psychological adaptation following adversity (Galatzer-Levy et al., 2018). Thus, the present study is in line with several reports advocating that the proportion of individuals showing lower SWB after a negative life event has been underestimated in past studies (Infurna & Luthar, 2016, 2018). Moreover, the identification of the vulnerable profile was only possible due to the use of multiple indicators. With a single indicator (e.g., joy), the identification of the vulnerable subgroup would not have been possible. Thus, the results of the profile analysis underlined the importance of a multidimensional perspective on psychological adaptation (Infurna & Luthar, 2018).

The results of the transition analysis revealed a higher tendency for stability in profile membership rather than change. Indeed, across all time points, the most probable transition was to stay in the same profile over time. This is in line with other profile transition studies in the field of psychological adaptation following a bereavement or Parkinson's disease (Bennett et al., 2019; Landau et al., 2016) and suggests that previous levels of SWB influence the psychological adaptation process. However, the results revealed more variety in the transitions between one and four years following the onset of CHC. These transition pathways suggest the occurrence of recovery patterns (upwards transition to a profile with higher levels of SWB) and delayed reaction patterns (downwards transition to a profile with lower levels of SWB) in the aftermath of the CHC onset, which have also been observed in past studies analyzing longitudinal trajectories (Galatzer-Levy et al., 2018).

Compared with the general population, individuals living with a physical CHC have a higher risk of sustaining lower mental health (Debnar, 2020). Similarly, the present study results demonstrate that half of the participants showed lower levels of SWB at least over three years. Moreover, the possibility of recovery or delayed reaction appears mostly between one and four years after the CHC onset. Together, the elevated risk of lower mental health and the observed transition interval underlines the need for long-term care of individuals sustaining a CHC. While a general practitioner follows up individuals suffering from diabetes or rheumatoid arthritis, other CHC's such as back pain or migraines do not necessarily imply systematic long-term care. The study results indicate that no matter the types of physical CHC, systematic follow-up appointments would be beneficial. Therefore, guidelines for the general practitioner should implement a systematic yearly follow-up for any CHC.

Predictors of Longitudinal Transitions

In the adverse life event literature, personality traits, such as emotional stability, have been shown to influence psychological adaptation (Hampson & Friedman, 2008; Strickhouser et al., 2017). The results of the present study confirm that more emotional stability is a protective factor against a delayed reaction from high to low SWB between one and four years following the onset of a CHC. Thus, having information concerning the personality traits of CHC patients might help health professionals determining the individuals at greater risk of developing poor SWB. A study by Israel et al. (2014) demonstrated how integrating personality measurement into clinical practice might help to prevent poorer health outcomes. However, implementation research is needed to establish the cost, feasibility, and utility of integrating personality measurement into clinical practice. Moreover, studies suggested that personality traits can be changed (Lucas & Donnellan, 2011; Roberts & Mroczek, 2008). For instance, an intervention study showed that participants engaging in more cognitive-

behavioral tasks such as journaling or practicing positive thinking increased their emotional stability scores from baseline to post-intervention (Hudson et al., 2018). In this sense, interventions tailored for individuals with lower emotional stability may be an avenue for the improvement of SWB following the onset of a CHC.

In line with previous studies, the results showed that better health (Burton et al., 2015; Zhu et al., 2014) and fewer past negative events (Seery & Quinton, 2016) are associated with an improvement in SWB between one and four years following the onset of a CHC. A surprising finding was that more financial scarcity was related to a recovery pattern from *low to high SWB*. So far, longitudinal studies have shown that financial scarcity is related to lower mental health following CHC onset (Kariuki et al., 2011; Morin et al., 2017). The conflicting results of the present study might be due to the time measurement. Indeed, financial scarcity was measured one year before the onset and might not represent the individuals' financial situation after the onset of the CHC. Another explanation for this surprising finding is the socio-demographics of the sample. As one might expect in a CHC sample, the participants of the present study are quite old, and 30.31% are retired. When retirees report that their household eats into their assets and savings, it does not necessarily mean that they experience financial scarcity. In the Swiss context of the present study, the retirement pension is not sufficient to keep a lifestyle similar to the pre-retirement one (Sousa-Poza & van Dam, 2001). Thus, retirees most often live from the savings accumulated before getting retired and it is nowadays considered as a normal financial situation during one's retirement.

The present study explored predicting factors across different types of physical CHC in an attempt to identify transversal factors that would predict psychological adaptation following any kind of CHC. Social support (Debnar et al., 2020; Li et al., 2018) or higher sense of spirituality (Harris et al., 2010) did not predict transition patterns of SWB in the present study. This unexpected finding may indicate that these factors may be protective factors in the case of specific types of CHC, but not in the face of any type of CHC.

Strength and Limitations

The main strength of the present project lies in its prospective study design and state-of-the-art statistical techniques, as well as its population based approach. Moreover, by using LTA, this study was able to shed light on the longitudinal unfolding of the psychological adaptation process while taking into account its multidimensionality. Besides, this study is one of the few using pre-event data, which enables to identify the specific impact of the CHC onset.

Nevertheless, several limitations of the present project need to be acknowledged. First, a methodological limitation is that the SHP does not provide CHC diagnostic information. Thus, it was not possible to test whether presenting certain types of physical CHC would increase the risk of changing towards a lower SWB profile. However, studies including multiple health events have shown that the type of disease (i.e., heart disease, lung disease, cancer, and stroke) is not related to psychological adaptation (Debnar et al., 2020; Morin et al., 2017). Nevertheless, further studies are needed to confirm that common patterns of psychological adaptation can be observed following different types of CHC. Second, one should be aware that the degree of vulnerability is usually underestimated in general population datasets, such as the SHP because more physically impaired individuals participate less in cohort studies (Rothenbühler & Voorpostel, 2016) and individuals living in institutions are typically excluded from such surveys (Voorpostel et al., 2018). Thus, the prevalence of vulnerable profiles in the present study might have been underestimated, and generalization to more physically impaired individuals should be done with caution. Third, the operationalization of psychological adaptation with measures that do not provide thresholds precludes any clinical assessment. Thus, the results of the present study do not inform on the potential risk of psychological disorders in the different profiles identified. Fourth, given that Switzerland is a developed country with a particular health system, including mandatory health insurance, the results could be comparable to developed countries having similar health services (mandatory health insurance or free health care) and similar age distribution. However, replication in other countries is needed to confirm the generalizability of the findings. Fifth, using secondary data limited the investigation of spirituality with only one item related to praying habits. Future investigation of multiple spirituality indicators would lead to a more multifaceted investigation of this complex concept. Sixth, performing multiple predictor analysis is known to increase type I errors, but a stricter p-value threshold using Bonferroni correction was not applied in the present study to avoid underpowered analysis and increased type II errors (Nakagawa, 2004). Hence, predictor findings need to be interpreted with caution, and further replications are advisable. Finally, the time spans between the psychological adaptation profiles are rather long (two to three years). Thus, short-time changes in SWB between the measurement time points cannot be observed. Future longitudinal studies would benefit greatly from incorporating more frequent assessment intervals to detect short-term fluctuations in SWB.

Conclusion

The 21st-century health care systems face new challenges due to the aging population and the consequential increase in CHC prevalence. The present study investigated both the

multidimensionality and longitudinal unfolding of psychological adaptation to the onset of a CHC. Despite a high degree of stability observed across time, this study points out the critical importance of long term care for individuals, because more varied transition patterns have been identified between one and four years following the onset of the CHC. In this sense, long-term care for individuals living with a physical CHC should be acknowledged, as it may be crucial to well-being improvement and prevention of potential comorbid depressive symptoms (Maurer et al., 2008). Personality traits and health status are factors predicting transitions between one and four years after the onset of a CHC. Integrating personality measurement might help health professionals determine which individual will be at greater risk for lower well-being. Furthermore, interventions increasing emotional stability is an avenue for better mental health of individuals living with a CHC.

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Table 1

Descriptive Statistics and Demographic characteristics

	M	*SD*	% missing	Kurtosis	Skewness	*α*	*λ*	*ρ*
SWB indicators								
Health Satisfaction T-1	7.61	1.56	30.80	3.65	-0.68			
Health Satisfaction T+1	6.92	1.84	11.42	4.81	-1.04			
Health Satisfaction T+4	6.98	1.83	8.08	4.38	-1.01			
Life satisfaction T-1	8.06	1.26	30.80	4.41	-0.76			
Life satisfaction T+1	7.74	1.37	11.11	5.98	-1.20			
Life satisfaction T+4	7.94	1.26	8.08	8.73	-1.35			
Joy T-1	7.39	1.15	30.80	5.24	-0.65			
Joy T+1	7.38	1.35	11.42	4.86	-0.64			
Joy T+4	7.26	1.23	8.08	4.40	-0.52			
Energy T-1	7.22	1.44	30.80	2.96	-0.40			
Energy T+1	6.99	1.55	11.42	4.66	-0.77			
Energy T+4	6.95	1.62	8.38	5.46	-1.11			
Worry T-1	2.68	2.22	30.80	3.49	0.93			
Worry T+1	2.96	2.26	11.11	2.78	0.69			
Worry T+4	3.10	2.02	8.08	2.95	0.59			
Sadness T-1	3.08	1.87	30.80	3.95	0.83			
Sadness T+1	3.37	1.99	11.11	3.37	0.70			
Sadness T+4	3.37	1.82	8.08	2.85	0.46			
Anger T-1	3.93	1.82	30.80	2.89	0.36			
Anger T+1	3.87	1.84	11.11	3.05	0.53			
Anger T+4	3.91	1.91	8.08	2.64	0.25			
Health related factors								
Health impediment T+1	2.90	2.59	11.42	2.45	0.57			
Improvement in health T+1	5.01	1.56	11.08	4.91	0.05			
Health status T+1	2.23	0.66	11.08	3.57	0.52			
Psychological factors								
Personality: Extraversion T0	6.80	1.77	21.96	2.40	-0.15	.40	.26	.29
Personality: Emotional stability T0	6.44	1.70	21.96	2.91	-0.29	.58	.42	.43
Personality: Conscientiousness T0	7.42	1.46	21.96	2.63	-0.25	.32	.20	.26
Personality: Agreeableness T0	6.89	1.30	21.96	3.00	0.03	.05	.02	.01
Personality: Openness T0	6.25	1.83	21.96	2.71	-0.19	.33	.19	.21
Number of past negative life event T-2 – T+4	5.96	4.21	21.96	4.48	1.08			
Praying T-2	3.11	1.58	41.57	1.44	-0.11			
Social factors								
Relationship satisfaction T-1	8.05	1.27	30.80	3.70	-0.52			
Social contact T-1	5.89	5.75	34.70					
Sociodemographic factors								
Years of education T-1	13.24	3.32	18.12	2.65	0.18			
Having a partner T-1 (N, %)	276	77.97	30.80					
Occupation T-1: Paid work (N, %)	185	59.87	27.03					
Financial scarcity T-1: Yes (N, %)	24	7.92	11.58					
Gender: Female T-1 (N, %)	204	57.14	0.00					
Age T-1	54.17	18.04	0.00					

Note. α = Cronbach's alpha; λ = Guttmann's lambda 6; *ρ* = Spearman Brown coefficient. As a reminder, the different rates of missing in the SWB indicators are due to the different sample sizes per time-point (N_{T-1} = 276, N_{T+1} = 324, N_{T+4} = 334).

Table 2

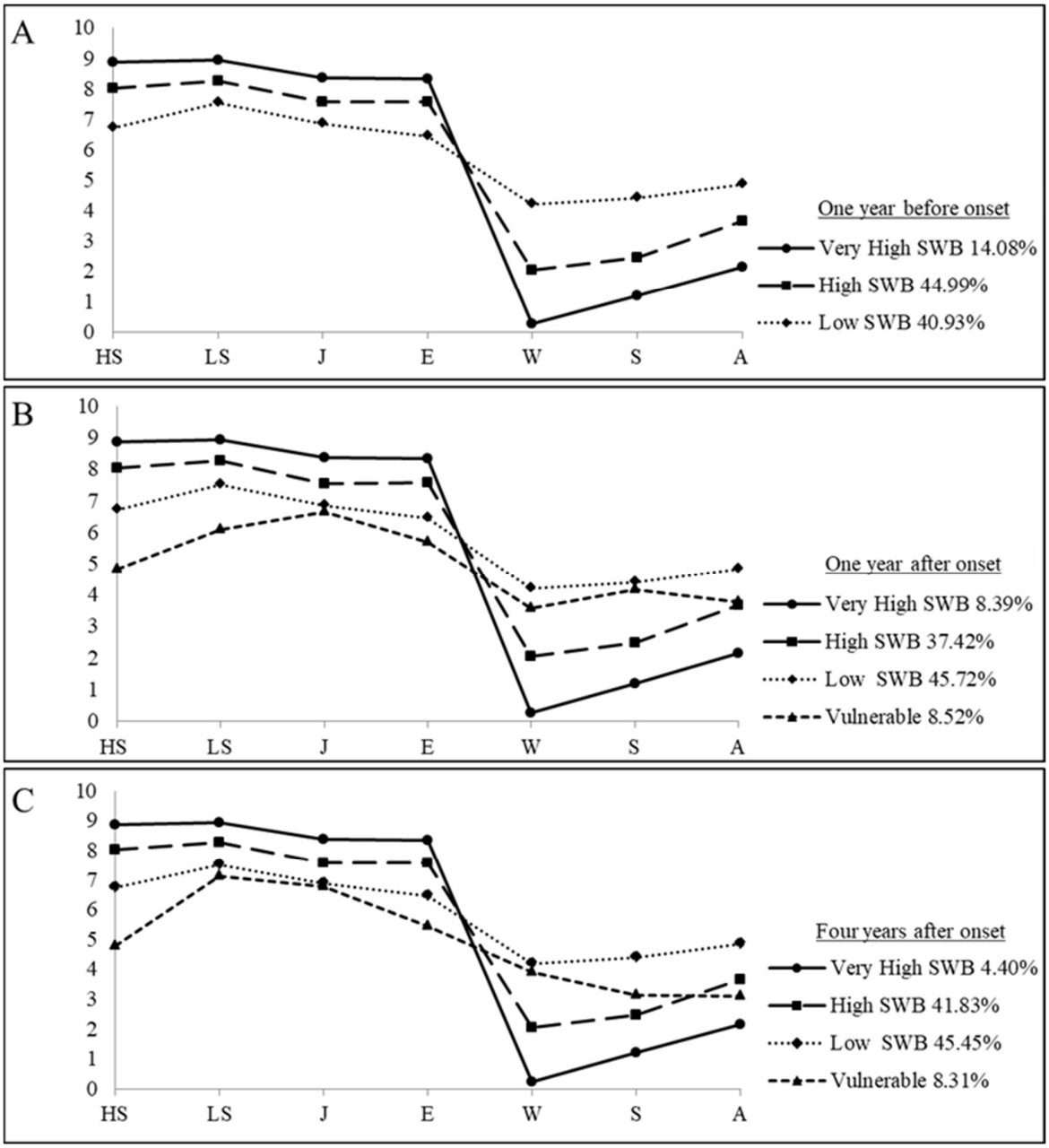
Fit Indices of the Latent Profile Analyses at T-1, T+1, and T+4

No of Profiles	BIC	BLRT (*p*)	Entropy	Profile Counts
T-1 year before onset				
2	7012.42	< .001	0.78	155/121
3	6977.18	< .001	0.80	130/109/37
4	6977.07	< .001	0.87	121/110/23/22
5 [a]	6999.32	< .001	0.81	99/84/43/41/9
T+1 year after onset				
3	8484.58	< .001	0.81	174/123/28
4	8441.57	< .001	0.77	153/125/27/20
5 [b]	8528.32	1.000	0.81	158/125/27/20/0
T+4 years after onset				
3	8579.05	< .001	0.81	183/135/16
4	8533.26	< .001	0.78	158/140/21/15
5 [b]	8620.43	1.000	0.81	158/140/21/15/0

Note. $N_{T\text{-}1} = 276$, $N_{T+1} = 325$, $N_{T+4} = 334$. BIC = Bayesian information criterion (smaller number is preferable); BLRT = bootstrapped likelihood ratio test (non-significance indicates that the model with one less profile is better); Entropy (high values > .80 indicate a high certainty of classification); Profile Counts = Final class counts and proportions for the latent classes based on their most likely latent class membership (profile counts > 5% of the overall sample size). [a]Due to local maxima, this solution may not be trustworthy. [b]The model did not converge. The standard errors of the model parameter estimates may not be trustworthy due to a non-positive definite first-order derivative product matrix.

Figure 1

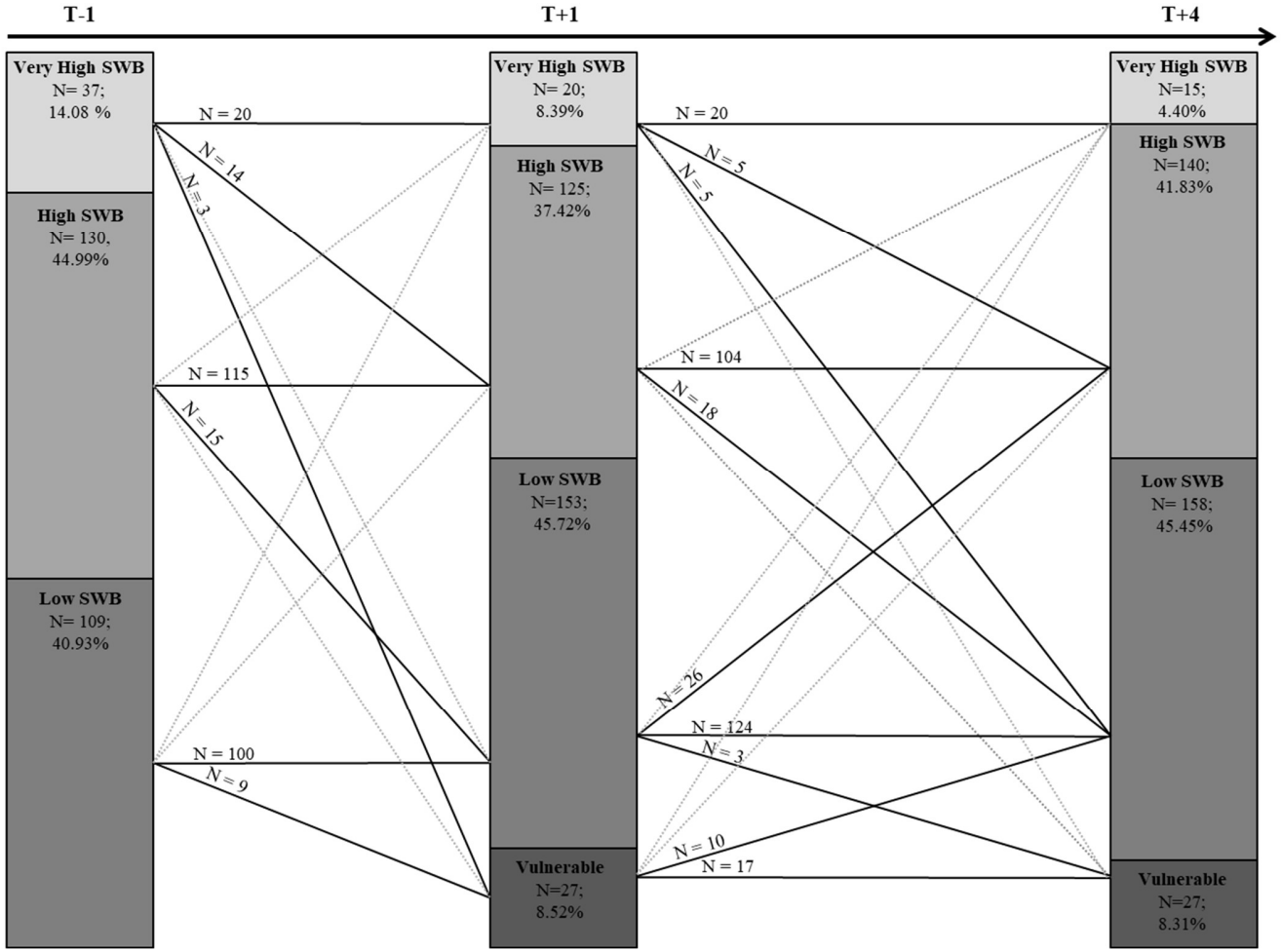
Profiles of SWB at T-1, T+1, and T+4



Note. A: Estimated means of the 3-profile solution one year before the onset (T-1), B: Estimated means of the 4-profile solution one year after the onset (T+1), C: Estimated means of the 4-profile solution four years after the onset (T+4). SWB = Subjective well-being, HS = Health satisfaction, LS = Life satisfaction, E = Energy, J = Joy, W = Worry, S = Sadness, A = Anger.

Figure 2

Profile transition between SWB profiles across T-1, T+1, and T+4



Note. Profile counts and profile transition counts are based on estimated posterior probabilities. $N_{T\text{-}1} = 276$, $N_{T+1} = 325$, $N_{T+4} = 334$. Transition patterns with less than two individuals are displayed with dotted lines.