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Latent Profile Analyses of Depressive Symptoms in Younger and Older Oncology Patients

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Abstract

The aging of America will include a significant increase in the number of older patients with cancer, many of whom will experience significant depressive symptoms. Although geriatric depression is a well-studied construct, its symptom presentation in the context of cancer is less clear. Latent profile analysis was conducted on depressive symptoms in younger (40–64 years) and older (≥ 65 years) patients with cancer ($N = 636$). The sample was clinically heterogeneous (i.e., included all stages, dominated by advanced stage disease). Participants completed questionnaires including the Center for Epidemiological Studies Depression Scale, which was used for the latent profile analysis. A four-class pattern was supported for each age group. However, the four-class pattern was significantly different between the younger and older groups in terms of the item means within each corresponding latent class; differences were primarily driven by severity such that across classes, older adults endorsed milder symptoms. An unexpected measurement issue was uncovered regarding reverse-coded items, suggesting that they may generate unreliable scores on the Center for Epidemiological Studies Depression Scale for a significant subset of patients. The results indicate that cancer clinicians can expect to see depressive symptoms along a continuum of severity for patients of any age, with less severe symptoms among older patients.

Keywords

depression; geriatric; aging; cancer; latent profile analysis; screening

Estimates of the U.S. population indicate that by 2060 the number of Americans aged 65 years and older will double from 46 to 98 million, and the number of those 85 years and older will triple from 6 to 20 million (Mather, Jacobsen, & Pollard, 2015). Moreover, the worldwide incidence of new cancer cases is expected to increase by 70% over the next two decades (Ferlay et al., 2013). These projections are primarily driven by the increasing population prevalence of older adults. Most older adults report increases in well-being as they age, with major depression occurring in approximately 5% to 6% of community-

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dwelling adults compared with only 2.6% of adults who are 65 years and older (Kessler et al., 2010; Stone, Schwartz, Broderick, & Deaton, 2010). However, estimates of the prevalence of depression (i.e., ranging from mild to severe) in older (65 years old) cancer patients have ranged from 17% to 25% (Holland & Evcimen, 2009). Given these epidemiological statistics, the public health significance of understanding, measuring, and intervening with depressed older cancer patients is undeniable.

Geriatric depression is a relatively well-studied construct. However, several authors have contended that current diagnostic criteria may underestimate depression in older adults (Gallo, Anthony, & Muthén, 1994; Gallo, Rabins, Lyketsos, Tien, & Anthony, 1997; Jeste, Blazer, & First, 2005). For example, Gallo et al. (1994) used structural equation modeling to cross-sectionally analyze a large epidemiological study of community-dwelling older adults (defined as 50 years or older). The sample was significantly less likely to endorse dysphoria (one of the “gateway” symptoms required for a diagnosis) compared with other depressive symptoms. They characterized depression in older adults as “depression without sadness,” noting that depressed older adults manifest irritability or social withdrawal more often than dysphoric mood. Later, these authors described nondysphoric depression as a syndrome that includes apathy, anhedonia, fatigue, sleep disturbance, and other somatic symptoms after following older adult participants over a 13-year study period (Gallo et al., 1997). Since they were originally reported, these observations have greatly influenced the way that depression is conceptualized and measured in geriatric psychiatry (e.g., Alexopoulos et al., 2002; Blazer, 2003; Covinsky, Cenzer, Yaffe, O’Brien, & Blazer, 2014; Mezuk, Edwards, Lohman, Choi, & Lapane, 2012; Fiske, Wetherell, & Gatz, 2009; Petkus & Wetherell, 2013). For example, a recent study found that anhedonia, not dysphoria, independently predicted risk for disability or death in a large sample of community-dwelling older adults over a 13-year period (i.e., 62 years or older; Covinsky et al., 2014).

In addition to a lower likelihood of endorsing depressed mood, research comparing the phenomenology of major depressive disorder (MDD) in older and younger adults suggests other key differences that may have implications for refining depression measurement based on age. For example, in a sample of community-dwelling older adults (65 years or older), excessive guilt and thoughts that life is not worth living were significantly less common among participants with MDD whose depression began after age 60 compared with those who had an earlier onset of depression (i.e., cross-sectionally; Gallagher et al., 2010). A metaanalysis of 11 studies examining MDD in older adults (Hegeman et al., 2012) found that, compared with younger depressed adults, several symptoms were significantly more common among older depressed adults, including psychomotor agitation, hypochondriasis, gastrointestinal somatic symptoms, and general somatic symptoms. Older adults had lower levels of guilt and were less likely to report diminished sexual interest. The findings from these studies must be heeded with caution, however, given that the majority are cross-sectional and do not account for the possibility of a cohort effect driving the differences between age groups (Tampubolon & Maharani, 2017). Additionally, it is difficult to synthesize this literature because of variations in how depressive syndromes are measured across studies.

Although the phenomenology of depression in older adults has been explored in multiple studies, depression is still poorly understood in more complicated clinical populations, such as older adults with serious medical illness. In these patients, the potential for symptom overlap is great. For example, the diagnosis of depression in older cancer patients is complicated by the fact that the same symptoms may arise from depression, from the cancer itself, from treatment side effects, or from aging-related changes (Saracino, Rosenfeld, & Nelson, 2016). It is important for clinicians in community practice to be able to “know what to look for” in older adults with cancer when evaluating depressive symptoms. Otherwise, the risk of failing to identify older patients who are at high risk for worsening depression and, in extreme cases, suicide, is great. While there has been extensive study of the utility of somatic items in formulating a depression diagnosis among the medically ill broadly (e.g., medical inpatients—Rapp & Vrana, 1989; primary care—Hendrie et al., 1995; general medicine, cardiology, and neurology—Koenig, George, Peterson, & Pieper, 1997; Koenig, Pappas, Holsinger, & Bachar, 1995), there has not generally been consensus on the “optimal” approach, and specifically, whether or not somatic items are reliable indicators of depression among the medically ill. Recent research indicates that somatic items may explain variance in depressive symptoms without erroneously inflating the prevalence (Jones et al., 2015; Mitchell, Lord, & Symonds, 2012; Saracino, Rosenfeld, & Nelson, 2018; Simon & Von Korff, 2006), yet many settings continue to opt for screening measures that eliminate somatic items from consideration (Lambert et al., 2015; Stafford et al., 2014; Wakefield et al., 2015), which decreases sensitivity and the risk of “missing” patients who are experiencing elevated depressive symptoms. Despite recognition of this complexity, the manner by which aging might influence the expression of depressive symptoms specifically in older cancer patients remains largely undetermined. A rigorous examination of the phenomenology of depression in older versus younger cancer patients is an important avenue for addressing this question.

In the past decade, the use of person-centered approaches such as latent class analysis (LCA) and its subtype, latent profile analysis (LPA), to examine the structure of psychopathology has become increasingly popular. Person-centered approaches (Laursen & Hoff, 2006) aim to cluster patients into unobserved categories based on their response patterns on the variables. On the contrary, variable-centered analysis aims to cluster variables into unobserved categories (e.g., factor analysis and item response theory). Person-centered analysis allows a more refined understanding of symptom presentations and is ideal for psychopathology research in that it allows one to identify heterogeneity within groups (Hybels, Blazer, Pieper, Landerman, & Steffens, 2009). LCA is often preferable to cluster analytic methods because it is a model-based approach, in which the characteristics of particular latent class can be specified a priori. Participants are not assigned to a latent group; rather, posterior membership probabilities are estimated for each latent class based on the model results. Goodness-of-fit statistics can also be calculated in LCA, whereas determining the number of classes in cluster analysis is somewhat arbitrary. LPA is a type of LCA that uses continuous indicators of symptom severity rather than binary indicators (i.e., symptom absence or presence; Tein, Cox, & Cham, 2013). Thus, LPA can provide more nuanced information for evaluating symptom profiles.

Several studies of community-dwelling older adults have identified distinct latent-class subtypes of depression (Hybels et al., 2009; Hybels, Blazer, Landerman, & Steffens, 2011; Lee et al., 2012; Mora et al., 2012). Hybels and colleagues (2009, 2011) identified four classes of depressive symptoms distinguished primarily by severity in a sample of 366 older adults with MDD. Lee et al. (2012) used LCA to identify subgroups of depressed older adults in a population-based epidemiological study. They identified three subgroups of depressed older adults. The largest subgroup (62%) was characterized as significantly depressed, with high endorsement of most symptoms (akin to MDD). The second subgroup (21%) had low endorsement of most depressive symptoms except moderate endorsements for appetite/weight changes, fatigue/loss of energy, and sadness. The average number of symptoms in this subgroup (about three) was analogous to minor depression. The third subgroup (17%) was characterized primarily by somatic symptoms: psychomotor changes, sleep disturbance, and fatigue. Although these studies identified classes that differed primarily by symptom severity, others have identified classes that appear phenotypically different. For example, Mora et al. (2012) also identified a four-class model of depressive symptom profiles using LPA with a self-report depression inventory in 420 community-dwelling older adults. The first two classes were characterized by low depression symptoms (68%) and high depression symptoms (5%; i.e., characterized by elevations in anhedonia, negative affect, and somatic problems). The other two classes were characterized by symptoms at subthreshold levels but with some notable differences. Specifically, the third class (18%) was characterized primarily by symptoms of anhedonia but with few somatic complaints and low levels of negative affect and negative interpersonal feelings. The fourth class (9%) was characterized by a moderate level of somatic complaints, anhedonia, and negative interpersonal feelings. There are fewer analogous studies using LCA and LPA in the medically ill and younger adults. One recent LCA study of oncology outpatients identified a three-class model of distress profiles distinguished by different personality profiles (Morgan et al., 2017). A review of the literature indicates only a handful of depressive symptom profiles among the general adult population. For example, one identified three subtypes of suicidality among community-dwelling adult men and another identified four mindfulness-based coping profiles among adults with a history of recurrent depression (Gu et al., 2017; Rice, Oliffe, Kealy, & Ogrudniczuk, 2018).

Although there is a burgeoning literature exploring latent classes of depressive symptoms in older adults, there are no parallel studies of depression among cancer patients. Therefore, whether or not latent classes exist in adult cancer patients, or in older adults with cancer in particular, remains unexplored. The current study sought to address this research question by comparing the latent profiles of depressive symptoms in samples of younger and older cancer patients. These analyses allow for an examination of how aging might affect the manifestation of depression in older adults with cancer. Additionally, an understanding of depression symptom profiles may enhance the ability of clinicians to identify late life depression in the cancer setting. It was hypothesized that, like in the previous studies of community-dwelling older adults, there would be multiple classes of depressive symptoms in each group and that there would be significant differences in the symptom profiles between groups. We specifically anticipated that the symptomatic profiles of older adults (i.e., 65 years and older) would be more likely to be characterized by anhedonia and somatic

symptoms compared with those profiles identified among younger adults (i.e., 40–64 years). Additionally, it was hypothesized that demographic and clinical characteristics would be differentially associated with each class (e.g., worse self-rated health status associated with depressive symptoms).

Method

Participants

Ambulatory cancer patients were recruited from the outpatient clinics at Memorial Sloan Kettering Cancer Center between January 2016 and May 2016. To be eligible for participation, patients had to be fluent in English, 40 years or older,¹ and have a cancer diagnosis. Trained research personnel approached patients who were waiting for routine clinic appointments and offered them participation in this study. Eligible patients were then informed of the study procedures, risks, and benefits, and asked if they wanted to participate. The study was approved by the Memorial Sloan Kettering Cancer Center and Fordham University Institutional Review Boards.

Procedure and Measures

All participants completed a packet of questionnaires in a fixed order, including the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977; Cronbach's $\alpha = .90$), which was used in the LPA to identify the latent class patterns in the younger and older patients. The CES-D is a 20-item self-report measure that asks participants to rate how they have felt during the past week on a 4-point Likert-type scale, with 0 indicating *Rarely or none of the time (< 1 day)* and 3 indicating *Most or all the time (5–7 days)*. The scale includes four factors: Depressive Affect, Positive Affect (i.e., Items 4, 8, 12, 16, which are reverse scored), Somatic Complaints, and Interpersonal Problems. Higher scores are indicative of more severe depressive symptoms (range = 0–60). The CES-D is widely used both in research and clinically with older adults and in a range of medical settings and it has demonstrated acceptable psychometric properties and assesses a wide range of depressive symptoms (i.e., affective and somatic; Hann, Winter, & Jacobsen, 1999; Lewinsohn, Seeley, Roberts, & Allen, 1997; Nelson, Cho, Berk, Holland, & Roth, 2010; Saracino, Weinberger, Roth, Hurria, & Nelson, 2017; Vodermaier, Linden, & Siu, 2009).

The questionnaire packet also included the Patient Health Questionnaire–9 (PHQ-9), which consists of nine items to measure each of the nine *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (*DSM-IV*) depression criteria (Kroenke, Spitzer, & Williams, 2001; Cronbach's $\alpha = .89$). The PHQ-9 has been widely recognized for its utility both with older adults and among the medically ill (Lamers et al., 2008; Richardson, He, Podgorski, Tu, & Conwell, 2010). For descriptive purposes, the prevalence of depression for each age group is reported in the “Results” section based on rigorous, algorithmic scoring of the PHQ-9, which has a higher threshold than traditional continuous scoring (Kroenke et al., 2001). PHQ-9 inclusive algorithmic scoring follows *DSM* scoring such that the presence of

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¹Age 40 was selected as the inclusion criteria cutoff in order to differentiate the sample from what the National Comprehensive Cancer Network (Coccia et al., 2018) operationalized as “Adolescent and Young Adult,” which refers to patients from 15 to 39 years of age.

a potential depressive syndrome requires the endorsement of at least one gateway symptom (i.e., Item 1 or 2 rated as a 2 or 3 on the PHQ-9) and a total of five symptoms (i.e., rated as a 2 or 3).

Additional sociodemographic and medical data were collected using a self-report questionnaire. Health status was assessed using a single item asking participants to rate their general health status from 1 (*Excellent*) to 5 (*Poor*); this single-item method has demonstrated adequate reliability and validity (Macias, Gold, Öngür, Cohen, & Panch, 2015; Mora et al., 2012). As an indicator of medical comorbidity, participants were also asked if they had any additional medical diagnoses in a free text box. For analyses, comorbidity was operationalized as dichotomously “present” or “absent.”

Data Analyses

Missing Data Analysis.—In the total sample of 663 patients, there were 27 patients (4.1%) who did not respond to any of the CES-D items for the LPA. These patients were not significantly different on all demographical and illness-related variables, $p > .05$. Patients who did not report on all the items were less likely to be currently be receiving depression treatment ($p = .04$) and to not have comorbidity ($p = .006$). For the remaining 636 patients, the missing data rates of the CES-D items (median = 3.9%, range = 1.9%–5.4%), PHQ-9 (3.6%), and patients’ demographic and illness-related variables (median = 0.0%, range = 0.0–3.6%) were not high. We concluded that listwise deletion for LPA analyses and maximum likelihood estimation for examining how demographic and clinical characteristics differed by class (i.e., three-step procedure described below) sufficed to handle these missing values.

Latent Profile Analysis.—A series of LPAs were conducted using robust maximum likelihood estimation in *Mplus* 7.31 (Muthén & Muthén, 1998–2012). Group differences in primary diagnosis were examined to determine whether or not cancer type should be included as a covariate in the analyses. Separate LPAs were conducted for the younger (ages 40–64 years) and older groups (≥ 65 years). This method was selected rather than including age as a continuous covariate because the study goal was to examine age effects on latent class patterns, in addition to class membership. Given potential concerns about 65 being an arbitrary cutoff in this clinical sample, the same analyses were run with a forced 5-year age split between groups (i.e., <65 years vs. ≥ 65 years). The same number of latent classes with similar class patterns were obtained. It was decided that the forced age split was not worth the decrement in power given that it resulted in a much smaller sample size in the older group, and thus, all participant data were included using 65 years as the age cutoff.

Models were estimated for two through six classes using the 20 CES-D items as indicators for the LPAs. A model was said to converge when the model results were successfully replicated with at least two sets of random start values and having no error messages in *Mplus* (e.g., no nonpositive definite first-order derivative product matrix). A maximum of 2,000 random sets of start values were used for each analysis to minimize the chances of obtaining local maxima results. Based on the recommendations by Nylund, Asparouhov, and Muthén (2007) and Tein et al. (2013), model fit of the models was compared using two

criteria. The first is the Bayesian information criterion (BIC), with lower BIC indicating better model fit. The second is the bootstrap likelihood ratio test (BLRT). BLRT tests whether there is significant improvement in model fit of the tested model above and beyond to the model with one less latent class. A significant test result supports the tested model. We also reported the entropy value, which is a measure of correctly classifying patients to different latent classes based on the model (ranging from 0 to 1, with value of 1 indicating perfect classification). In addition to these criteria, we selected the best-fitting model by studying the meanings of the latent class profiles of the models. We also calculated the standardized item mean differences (Cohen's d) between each class to elucidate the magnitude of the item-level differences. We used a small value of Cohen's (1988) $d = .2$ as a suggested value to indicate meaningful differences.

To compare the latent class differences on patients' demographic characteristics (race, ethnicity, marital status, and education), depression treatment status (past and present), and illness-related variables (disease stage, cancer treatment status, perceived health status, and comorbidity), we used the recommended three-step procedure that corrects for classification uncertainty based on the simulation results by Asparouhov and Muthén (2013, 2014). The *Mplus* DCAT (i.e., distal outcomes for categorical variables) procedure was used when the variables were categorical (Lanza, Tan, & Bray, 2013), while the BCH procedure was used when the variables were continuous (Bakk & Vermunt, 2016; Bolck, Croon, & Hagenaars, 2004). Listwise deletion was used in the three-step procedures.

We followed the suggested procedures by Morin, Meyer, Creusier, and Biétry (2016) to test the invariance of the latent class profiles between the younger and older patients. The first step is to test whether the two groups had the same number of latent classes. This test is conducted through the LPA procedure described previously. If the first step holds, the next step is to test whether each class has the same item means between the two groups. To conduct this test, we first estimated a two-group LPA model that allows the item means of each corresponding latent class to be different between the two age groups (Model 1). Second, we estimated another two-group LPA model that constrains the item means of each corresponding latent class to be equal between the two age groups (Model 2). We used two criteria to evaluate the invariance. The first criterion is the likelihood ratio test between Models 1 and 2, where a nonsignificant test result supports invariance. However, this test is sensitive to trivial differences when sample size is large. The second criterion, which is less sensitive to large sample size, is the standardized item mean differences (Cohen's d) of each corresponding class between the two groups (younger–older patients). As above, we used a small value of Cohen's (1988) $d = .2$ to support invariance. If this step holds, the next two steps are to test whether each class has the same item variances and frequencies between the two age groups. Because the results showed that the two groups did not achieve the invariance of same item means across classes (discussed later), we did not test these two steps and the procedures are not outlined here.

Results

Participant Characteristics

The sample ($N = 636$) included slightly more men (52.4%; $n = 333$) than women (47.0%; $n = 299$); four individuals (0.6%) did not indicate gender. The sample ranged in age from 40 to 90 years or older² ($M = 64.96$ years, $SD = 10.12$). Most participants were White (87.1%; $n = 554$); 5.5% were Black ($n = 35$) and 8.2% ($n = 52$) identified as Hispanic. Most participants were married or living with a partner (71.5%; $n = 455$) and had a college and/or graduate education (68.9%; $n = 438$). The most common cancer diagnoses were gynecological (16.0%; $n = 102$), prostate (14.3%; $n = 91$), lung (14.3%; $n = 91$), and colorectal (8.2%; $n = 52$). The presence of a secondary cancer diagnosis was reported by 11.4% ($n = 72$) of the sample and slightly over one third reported Stage 4 disease (37.1%; $n = 236$). The majority of participants had received active cancer treatment within the preceding 6 months (70.4%; $n = 448$) and 36.0% ($n = 229$) endorsed at least one comorbid medical condition. The most frequent comorbid medical diagnoses reported were hypertension (11.9%; $n = 76$), other cardiovascular conditions (6.4%; $n = 41$), and diabetes (5.3%; $n = 34$). Approximately one quarter of the sample reported past treatment for depression (23.7%; $n = 151$), and 16.5% ($n = 105$) reported currently receiving treatment for depression. Sixty participants (9.4%) likely had major depression according to the PHQ-9 inclusive algorithm (i.e., considering all symptoms endorsed, regardless of possible etiology).

Older and younger samples did not differ significantly by gender, ethnicity, disease stage, or treatment status (Table 1). However, a significantly higher percentage of younger participants identified their race/ethnicity “other” compared with the older group, while significantly more participants in the older group identified as White. The older group also included significantly more widowed participants than the younger group, and significantly fewer single/never married participants. The younger group included more participants with a college degree compared with the older group, whereas participants in the older group were significantly more likely to report a comorbid medical condition than the younger group. Additionally, the younger group was significantly more likely to report a history of treatment for depression than the older group, but was not more likely to be receiving treatment for depression at the time of study participation. There was no significant difference between groups in the number of people who likely had major depression according to the PHQ-9.

There were significantly more lung cancer patients in the older group and colon cancer patients in the younger group (Table 1). However, given the overall diagnostic heterogeneity of the sample and relatively small diagnostic subgroups, diagnosis was not included as a covariate in LPA analyses.

Latent Profile Analysis

Younger Group (40–64 Years Old).—Among the younger participants, only the two-, three-, and four-class models converged with no error message and successfully replicated

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²Because of HIPAA (Health Insurance Portability and Accountability Act) protection, participants who were 90 years or older checked a box indicating they were in this age range; two participants fell into this category.

with at least two sets of random start values. Models did not converge when five or more latent classes were estimated, most likely due to increasing number of parameter estimates. Therefore, only the results of these three models were compared. Both the BIC and BLRT supported the four-class model (Panel A in Table 2). This model also has a high entropy value (.94), indicating high classification accuracy of patients into latent classes (.97 for Class 1, .95 for Class 2, .97 for Class 3, and .99 for Class 4). In addition, each latent class had unique clinical meaning. Panel A in Figure 1 shows the raw item means of each latent class among the younger group.

Class 1 ($n = 142$, 47.6%) was labeled “low symptoms” as it had relatively low-level severity scores on all CES-D items. Class 2 ($n = 81$, 27.4%) was labeled “mild depressive symptoms” as it had mild elevations across the majority of CES-D items. Class 4 ($n = 38$, 12.8%) was labeled “moderate depressive symptoms,” as it had higher severity of nearly all CES-D items. Across all items, the standardized mean difference (Cohen’s d) of the moderate depression class minus the mild depression class were all positive ($Mdn = 1.24$; range = 0.30–2.99), which means that all item means were higher in the moderate symptom class. Cohen’s d of the mild depression class minus the low symptoms class were also all positive ($Mdn = 0.98$; range = 0.21–1.84). Interestingly, the results also revealed a Class 3 ($n = 36$, 12.1%), labeled “patterned response,” which had low levels of all CES-D items but high levels on Items 4, 8, 12, and 16 in CES-D. These four items were all positively worded (e.g., Item 4: “I felt I was just as good as other people.”) and reverse scored before entering them into the LPA. For these four items (4, 8, 12, 16), the patterned response class means were greater than those of the moderate depression class (median Cohen’s $d = 1.01$; range = 0.46–1.48). For all other items, the means of the patterned response class were about the same as those of the low symptoms class (median Cohen’s $d = .06$), with only four items having a Cohen’s d (patterned response—low symptoms) value that was greater than .20 (small effect size; Item 1 = .35, Item 5 = -.24, Item 6 = .34, Item 19 = .30).

The four classes differed on past depression treatment history, $\chi^2(3) = 39.91$, $p < .001$, and current depression treatment history, $\chi^2(3) = 31.78$, $p < .001$. Compared with the “mild” and “moderate” depression classes, the “low symptoms” and “patterned response” classes had significantly fewer patients who had received depression treatment both in the past (“low symptoms”: 13.8%, “patterned response”: 25.4%, “mild depressive symptoms”: 45.3%, “moderate depressive symptoms”: 60.4%) and at the time of study participation (“low symptoms”: 5.5%, “patterned response”: 15.2%, “mild depressive symptoms”: 35.6%, “moderate depressive symptoms”: 31.2%; except the difference between the “patterned response” and “moderate depressive symptoms” class was not significant).

For participants’ demographic variables, the four classes did not significantly differ on race, $\chi^2(12) = 5.73$, $p = .93$; ethnicity, $\chi^2(3) = 2.14$, $p = .54$; or education level, $\chi^2(3) = 1.91$, $p = .59$, while they did significantly differ on marital status, $\chi^2(9) = 17.74$, $p = .04$, and gender, $\chi^2(3) = 26.24$, $p < .001$. There was a higher proportion of patients who were single (never married) and divorced/separated in the “moderate depressive symptom” class than other classes. There were significantly more male patients in the “low symptoms” (60.7%) class and the “patterned response” class (60.5%) than in the “mild” (31.7%) and “moderate” depression classes (28.7%).

For illness-related variables, participants in the four classes did not significantly differ by disease stage, $\chi^2(3) = 2.09, p = .55$; cancer treatment status, $\chi^2(3) = 5.46, p = .14$; or comorbidity, $\chi^2(3) = 2.51, p = .47$. They did differ in perceived health status, $\chi^2(3) = 31.60, p < .001$, such that increasingly worse health status was reported by those in the “mild” and “moderate” depression classes compared with the “low symptoms” and “patterned response” classes. All pairwise comparisons were significant ($ps < .05$) except that between “low symptoms” and “patterned response” classes.

Older Group (65 Years Old).—For the older group, only the two-, three-, and four-class models converged with no error message and successfully replicated with at least two sets of random start values. Models did not converge when five or more latent classes were estimated, mostly likely due to increasing number of parameter estimates. Therefore, only the results of these three models were compared. Both the BIC and BLRT supported the four-class model (Panel B in Table 2). This model also had a high entropy value (.94), indicating high classification accuracy of patients into latent classes (.97 for class 1, .94 for class 2, .97 for class 3, and .99 for class 4). In addition, as with the younger group, each latent class had unique clinical meaning. Panel B in Figure 1 shows the raw item means of each latent class of the younger patients. The classes derived in the older group were strikingly similar to those identified in the younger group and were therefore given the same labels in order to facilitate comparison. Thus, Class 1 ($n = 184, 54.3\%$) was labeled “low symptoms” as it had relatively low severity levels of all CES-D items. Class 2 ($n = 67, 19.7\%$) was labeled “mild depressive symptoms” as it had mild levels of most CES-D items. Class 4 ($n = 39, 11.4\%$) was labeled “moderate depressive symptoms,” as it had higher levels of most CES-D items. Effect sizes between the moderate depression class and the mild depression class were positive for the majority of items ($Mdn = 1.25$, range = 0.32–3.10) except for Item 4, which was slightly higher in the mild depression class (i.e., “I felt that I was as good as other people”; Cohen’s $d = -.04$). Cohen’s d values of the mild depression class minus the low symptoms class were all positive ($Mdn = .96$, range = 0.37–1.98). As in the younger adult group, the results also revealed a Class 3 ($n = 50, 14.6\%$) labeled “patterned response,” which had low levels of all CES-D items but high levels on Items 4, 8, 12, and 16 in CES-D. For these four items (Items 4, 8, 12, 16), the means of the patterned response class were greater than those of the moderate symptom class (median Cohen’s $d = 1.11$, range = 0.84–1.70). For all other items, the means of the patterned response class were about the same as those of the low symptoms class (median Cohen’s $d = .10$), with only five items that had Cohen’s d (patterned response— low symptoms class) values greater than .20 (small effect size; Item 1 = .27, Item 2 = .24, Item 5 = .53, Item 7 = .32, Item 17 = .22).

Across all items, the median Cohen’s d between the moderate depression class and mild depression class was 1.11 (range = -0.04 to 3.10) and that between the mild depression class and low symptoms class was .96 (range = 0.37 to 1.98). As in the younger group, the results also revealed a Class 3 ($n = 50, 14.6\%$), which had low levels of all CES-D items but high levels on Items 4, 8, 12, and 16 (i.e., the reverse-coded items). Among these four items, their means in Class 3 were even greater than those of the major depression class with median Cohen’s $d = 1.11$ (range = 0.84–1.70). For all other items, the means of Class 3 were about

the same as those of the low symptoms class by median Cohen's $d = .10$ (range = $-.06$ to $.53$). As in the younger group, this class was labeled "patterned response."

For the older group, participants in each class differed significantly by past, $\chi^2(3) = 22.88, p < .001$, and current depression treatment history, $\chi^2(3) = 22.22, p < .001$. Compared with the "patterned response" and the "mild" and "moderate" depression classes, the "low symptoms" class had significantly fewer patients who had depression treatment both in the past ("low symptoms": 8.6%, patterned response: 21.7%, "mild": 29.4%, "moderate": 41.2%) and currently ("low symptoms": 5.3%, patterned response: 12.9%, "mild": 29.9%, "moderate": 36.1%). Additionally, these percentages were generally lower than those among the younger patients in all classes.

For demographic variables, the four classes did not significantly differ by race, $\chi^2(9) = 9.65, p = .38$; ethnicity, $\chi^2(3) = 2.04, p = .56$; marital status, $\chi^2(9) = 5.89, p = .75$; education, $\chi^2(3) = 2.51, p = .47$; or gender, $\chi^2(3) = 4.35, p = .23$. For illness-related variables, the four classes did not significantly differ on disease stage, $\chi^2(3) = 4.12, p = .25$, or comorbidity, $\chi^2(3) = 3.17, p = .37$. However, they did significantly differ on whether or not they received cancer treatment within the past 6 months, $\chi^2(3) = 8.41, p = .04$, such that compared with the "mild" (84.7%) and "moderate" depression (86.9%) classes, the "low symptoms" class had fewer participants (71.4%) who were on active treatment. Additionally, self-rated health status, $\chi^2(3) = 32.53, p < .001$, was significantly worse among those in the "mild" and "moderate" depression classes relative to the "low symptoms" and "patterned response" classes (pairwise comparisons were significant [$p < .05$] except that between "low symptoms" and "patterned response," and between "mild" and "moderate" depression).

Invariance Between Groups.—Per our data analytic procedures described previously, we tested the invariance of latent class profiles between the two age groups. First, the likelihood ratio test shows that the item means of corresponding latent class were significantly different between the two age groups, $\chi^2(80) = 102.01, p = .049$. To better understand this overall effect, we computed the Cohen's d (i.e., younger–older patients) of each latent class between the two groups and found that for each class, most items were notably lower among older compared with younger adults (Table 3). In the "low symptoms" class, 7 out of 20 items (35%) had Cohen's d values greater than .2, with one having negative difference (Item 4) and six having positive differences (Items 5, 6, 7, 9, 10, 11). In the "mild depressive symptom" class, 10 out of 20 items (50%) had Cohen's d values greater than .2, with one having negative difference (Item 4) and nine having positive differences (Items 1, 5, 7, 9, 10, 13, 14, 17, 18). In the "moderate depressive symptom" class, 15 out of 20 items (75%) had Cohen's d values greater than .2 (Items 1, 3, 5, 6, 7, 9, 10, 12, 13, 14, 15, 17, 18). For the "patterned response" Class, 9 out of 20 items (45%) had Cohen's d values greater than .2 in value, with three having negative difference (Items 5, 12, 17) and six having positive differences (Items 1, 6, 8, 10, 11, 19).

Additional Analyses.—Because the questionnaire packet also included the PHQ-9, we initially conducted the LPAs using all CES-D and PHQ-9 items. In such analyses using the whole sample ($N = 663$), models converged up to six classes. The four-class model supported the profiles of "low symptoms," "mild depressive symptoms," "moderate

depressive symptoms,” and “patterned response.” In the “patterned response” class, no PHQ-9 items had high item means. The item mean differences of the PHQ-9 items between the “patterned response” and “low symptoms” class were small (median Cohen’s $d = .14$; range = .04–.34; detailed results available on request). However, the LPAs using all CES-D and PHQ-9 items did not converge when the sample was stratified by age group when four or more classes were estimated. We further conducted two separate LPAs, one using the CES-D items only and one using the PHQ-9 items only. For LPA using PHQ-9 items only, models converged neither in the whole sample nor in either age group when three or more classes were estimated. To summarize, the PHQ-9 items for the whole sample suggested a three-class model for the PHQ-9 items (“low symptoms,” “mild depressive symptoms,” and “moderate depressive symptoms”). This implies a potential advantage of using PHQ-9 items over CES-D items in understanding and creating the latent profiles of depressive symptoms for oncology patients. Notably, this further reflects the potential complications associated with reverse-coded items like those in the CES-D. However, here the LPAs did not converge either age group, most likely because of the quality of the data or sample size, so cannot be interpreted.

We also conducted three additional analyses to further understand the LPA results using the CES-D items. In the first analysis, we conducted LPA of the CES-D items except Items 4, 8, 12, and 16, which had high mean levels in the “patterned response” class. Results supported a three-class model for both age groups. In both age groups, the three-class models replicated the “low depressive symptoms,” “mild depressive symptoms,” and “moderate depressive symptoms” classes in the presented results, while, not surprisingly, the “patterned response” class disappeared. These results supported that these four items account for the appearance of the “patterned response” class. In the second analysis, we conducted LPA of the CES-D items except Items 15 and 19. This analysis was based on concerns that these two items (i.e., the interpersonal subscale of the CES-D) seemed to not be especially good discriminator items. Results replicated the four-class models for both age groups. In the third analysis, we conducted LPA of the CES-D items without patients who reported zeros on all items. This analysis was based on concerns about the potential validity of these patients. Results replicated the four-class models for both age groups. A full report of these results is available on request.

Discussion

Previous studies have implemented LCA to explore depression in community-dwelling older adults (Hybels et al., 2009; Hybels et al., 2011; Lee et al., 2012; Mora et al., 2012). These studies have repeatedly identified multiple latent classes of depressive symptoms that varied by symptom type and severity. However, there have been no prior studies exploring symptom profiles of depression in patients with cancer, nor contrasting younger and older adults. We specifically anticipated that the symptomatic profiles of older adults would be more likely to be characterized by anhedonia and somatic symptoms compared with those profiles identified among younger adults; this hypothesis was not supported. Additionally, it was hypothesized that demographic and clinical characteristics would be differentially associated with each class (e.g., worse self-rated health status associated with depressive symptoms), and this hypothesis was supported. We tested and compared the fit of multiple

LPA models, finding that a four-class model was the best fit for each group and mean probabilities of class membership demonstrated strong discrimination. Within each subsample (older and younger adults), the four classes were primarily differentiated by differences in symptom severity, which supports the notion that psychopathology, and depressive symptoms in particular, occur along a continuum of severity. Calculation of effect sizes illuminated item-level differences between groups and across profiles (Figure 2; Table 3). Although at face value the four classes in both groups appear to parallel one another overall, analyses of invariance between groups suggested that the older group's underlying classes differ significantly from those of the younger group, thus, supporting the study hypothesis that younger and older adults have different depressive symptom presentations in the oncology setting. However, the most salient differences occurred in overall symptom severity (i.e., not in terms of anhedonia and somatic items as we had hypothesized), with older adults reporting less severe depressive symptoms; item-level differences are discussed below.

Some of the current findings are remarkably consistent with past literature, including lower overall prevalence of depressive symptoms among older compared with younger adults (Stone et al., 2010). However, our results did not identify any obvious phenotypical differences in depressive symptom presentation such as those described in the past (Fiske et al., 2009; Gallo et al., 1994; Gallo et al., 1997; Jeste et al., 2005). For example, contrary to hypotheses, there was no evidence of a more anhedonic or somatic symptom presentation in our older adult group. Instead, comparison of the latent profiles of younger and older samples demonstrated many similarities. Analyses of invariance between age groups indicated distinct response patterns, which again, appeared to be primarily driven by lower symptom endorsement among older participants.

For three out of four profiles, there were minimal item-level differences in terms of effect sizes between younger and older adults. However, moderate to large effect sizes emerged in the major depression class (Figure 2; only those effects > 0.40 are reported for illustrative purposes) including Items 5 (concentration), 9 (life had been a failure), 13 (talked less than usual), 15 (people were unfriendly), 17 (crying spells), and 19 (people disliked me). Thus, consistent with past research, cognitions such as "I thought my life had been a failure" (i.e., CES-D Item 9) and other "classic" indicators of depression such as crying spells and diminished speech were not as salient even among the most symptomatic group of older adults. The two items that make up the interpersonal difficulties subscale of the CES-D, "People were unfriendly" (Item 15) and "I felt that people dislike me" (Item 19) had very low means in both groups but were substantially lower in the older adult moderate symptom class. These findings suggest that regardless of age, this interpersonal subscale may not be particularly useful among patients with cancer, whose depressive symptoms may be more related to the cancer experience itself rather than potential cognitive distortions around interpersonal relationships that might better characterize individuals who are physically "healthy" and depressed. Generally, these item-level differences are consistent with past geriatric depression research indicating that depressed older adults are less likely to report feeling like a failure and suggest that they may be less likely to endorse interpersonal symptoms associated with depression as well (Ellison, Kyomen, & Harper, 2012; Hertzog, Van Alstine, Usala, Hultsch, & Dixon, 1990).

An important consideration when interpreting the depressive symptom endorsement patterns of younger and older groups is a potential cohort effect, which cannot be ruled out given the cross-sectional study design. It is well established that successive birth cohorts over the past century have demonstrated an increasing lifetime incidence of depression, a phenomenon known as the “cohort effect” (Lavori et al., 1987; Lewinsohn, Rohde, Seeley, & Fischer, 1993; Wickramaratne, Weissman, Leaf, & Holford, 1989). For example, the large-scale epidemiological catchment area study, based on probability samples of more than 18,000 adults from across the United States, identified a sharp increase in the rate of major depression for both sexes in the birth cohort born between 1935 and 1945, and an earlier onset of MDD across cohorts (i.e., the cohort that came to maturity after World War II; Wickramaratne et al., 1989). In fact, the probability of reporting a past major depressive event prior to age 34 years was 10 times greater in the 1945–1954 birth cohort than in the 1905–1914 cohort. Additional research found that older cohorts were more likely to exhibit tendencies toward social desirability in their response patterns, and less likely to characterize symptoms of major depression as a psychological or emotional problem than were younger individuals (Hasin & Link, 1988; Lewinsohn et al., 1993). Although there is a dearth of recent research examining possible cohort effects, older participants in the current study were generally born between the years of 1926 and 1951, with the younger group including participants born between 1952 and 1976. Thus, the cohort effects described by past researchers may apply to the older group included in this study and explain the lower depressive symptom scores endorsed by older adults.

Many cancer settings are in the process of determining optimal screening and depression assessment procedures, and choosing appropriate measures is of the utmost importance for effective triage and referral (Pirl et al., 2014). The current study suggests that a subgroup of participants in the cancer setting may be susceptible to providing “patterned responses” on the CES-D. This is evidenced by the four elevations in scores on Items 4, 8, 12, and 16, which are the only reverse-coded items on the CES-D and comprise the “positive affect” subscale of the CES-D. It is not likely to be pure coincidence that these same items are seen as the only definitive elevations in these classes within each study group (see Figure 1). It is most probable that a subset of participants were not attentive to the reversal of these items and, intending to indicate “symptom absent” on all items, inadvertently endorsed these four items in an inconsistent manner. Methodological research examining the utility of reverse-coded items questions their reliability (Hughes, 2009; Swain, Wethers, & Niedrich, 2008; van Sonderen, Sanderman, & Coyne, 2013; Weems & Onwuegbuzie, 2001). Using mixed stems may decrease score reliability and a measure’s internal consistency (Hughes, 2009). Swain et al. (2008) coined the term *misreponse* to characterize instances in which respondents select responses on the same side of the scale neutral point for both reversed and nonreversed items. They found that misresponse to reverse-coded Likert items averaged approximately 20%. In the present data, an example of misreponse on the CES-D would be an instance when a participant endorsed a score of 0 for both “I was happy” (Item 12) and “I felt sad” (Item 18). There are multiple possible explanations for these errors, including inattention and respondent acquiescence, in which there is a tendency toward uncritical agreement with items (Swain et al., 2008). Regardless of its lack of obvious clinical utility, this class does represent a consistent response pattern in both age groups. Interestingly,

participants in both groups who were members of this class were significantly more likely to have a history of depression treatment compared with the “low symptom” class, raising questions about whether this “misresponse” style might also reflect other underlying clinical characteristics. Regardless, the identification of this class in both age groups raises questions about the reliability of reverse-coded items in the oncology setting; this pattern would not have been identified without LPA. Researchers and clinicians should weigh the relative risks of potential score inflation when using the CES-D or another measure with reverse-coded items, where hurried patients may not detect the response option changes and provide erroneously inflated scores.

For both the younger and older groups, participants across classes did not significantly differ by race, ethnicity, or education. Similarly, illness-related variables including disease stage and comorbidity were not different across classes. However, being single and/or female in the younger group and being on active cancer treatment in the older group was associated with a higher magnitude of depressive symptoms. This is generally consistent with ample past research supporting the higher rate of depressive symptoms (and depressive disorders) among women in the general population (Bjelland et al., 2008; Ferrari et al., 2013; Kessler, McGonagle, Swartz, Blazer, & Nelson, 1993).

Not surprisingly, the observed classes also varied significantly (for both groups) by history of depression treatment and current depression treatment status. Those in the mild and moderate depressive symptom classes were more likely to report past or current mental health treatment for depression. These findings suggest that those with a history of depression are more likely to experience a recurrence of depressive symptoms in the face of a stressor such as cancer; they also reiterate previous research that has found mild depression to be a risk factor for the later onset of a major depressive episode.

Self-rated health status was also significantly different across all four classes in each group such that it was worse as depressive symptom severity increased from minimal to the “mild depressive symptom” and “moderate depressive symptom” classes. These findings are consistent with Mora et al.’s (2012) LPA study with community-dwelling older adults in which each of the four classes differed significantly along self-rated health status. However, due to the cross-sectional nature of this study and the potential for self-report bias regarding health status, it is not possible to determine whether being depressed causes cancer patients to perceive their health status as worse, vice versa, or both. Regardless, the clear differences in perceived health status between classes underscores an additional variable that may be important to consider when evaluating an individual for depression and/or distress more generally and suggests that even subthreshold depressive symptoms are significantly related to one’s perceived health status.

Limitations and Future Directions

There are several methodological limitations that may influence the interpretation of the study findings. First, no systematic measure of physical functioning, and no objective disease data (i.e., extracted from individual patients’ medical records) were obtained. Instead, indicators of medical comorbidity, disease stage, treatment, and health status were all based on participants’ self-assessment, which have limited reliability. For example,

medical comorbidity was not rated in terms of severity, but rather as present or absent, which may obscure participant differences associated with varying levels of disease burden. Similarly, although we obtained information about types of current cancer treatment, for those who were off treatment, we did not assess further. Thus, we cannot determine which of these participants were between treatment lines, on palliative care, in remission, or other clinical status. Additionally, information regarding other psychiatric diagnoses was not obtained. This method was selected in order to prioritize brevity over comprehensiveness, as obtaining complete responses to depression questionnaires and minimizing burden were more central to the study hypotheses. The study sample was also predominately White and well educated. Thus, the generalizability of these results across patients of more diverse races, ethnicities, and socioeconomic status, are unknown. Greater variability in depression symptoms may have been found if the sample had been more diverse.

Use of LPA represents a major strength of the present study. The robustness of the classes identified and their significant associations with other demographic and health status variables underscore the utility of LPA and of studying psychopathology. Future research should explore whether or not these symptom profiles are differentially associated with prognosis or other dimensions of well-being among patients with cancer over time. Longitudinal analyses may also provide insight into symptom etiology and inform the development of targeted interventions. Additionally, class-membership has the potential to be a useful category in research to identify the specific prognostic associations of depressive symptoms.

Conclusions

There is professional consensus that depressive symptoms across the spectrum can disrupt the cancer trajectory of any patient (Pirl et al., 2014). The current findings are the first to apply LPA to studying depression in the cancer setting, or among medical patients more generally. A four-class pattern emerged but was significantly different between the younger and older groups in terms of the item means within each corresponding latent class, such that older adults consistently endorsed milder symptoms. An unexpected measurement issue was uncovered regarding the reverse-coded items, suggesting that they may generate invalid scores on the CES-D for a significant subset of patients. Taken together, the results indicate that cancer clinicians can expect to see depressive symptoms along a continuum of severity for patients of any age, with less severe scores among older patients. Whether these severity differences reflect genuine increases in well-being, a cohort effect, or the failure of existing self-report measures to capture depressive symptoms in older adults, warrants further investigation. The determination of a “best practice” method for depression screening and assessment will allow clinicians to facilitate coping with aging and illness-related changes, with the ultimate goal of promoting successful aging and preserving optimal quality of life. Clinicians should be diligent in their assessments of older patients, who are less likely to present with some of the more obvious indicators of depression such as tearfulness and worthlessness or guilt. Without such consideration, many older patients who are experiencing significant symptoms will continue to be “missed” during routine clinical encounters.

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Figure 1.

Raw means of depression indicators by class—both age groups.

Note. Raw item means by class (Panel A: younger group 40–64 years old; Panel B: older group ≥ 65 years old). CES-D = Center for Epidemiological Studies Depression Scale.

Figure 2.

Class comparison of raw means of depression indicators for younger versus older groups.

Note. Class comparison of means of depression indicators for younger versus older groups. CES-D stands for the Center for Epidemiological Studies Depression Scale. Younger group included participants aged 40 to 64 years, and older group included participants aged 65 years and older.

Table 1.

Comparison of Demographic Characteristics Between Groups.

Demographic	Characteristics	Older group ^a (n = 339)		Younger group (n = 297)		χ^2	p
		n	%	n	%		
Age, years, <i>M</i> (<i>SD</i>)		72.7 (5.84)		56.2 (5.86)			
Gender	Male	189	56.1	144	48.8	3.36	.08
	Female	148	43.9	151	51.2		
Race	White	305	90.5	249	84.1	10.57	.03
	Black	18	5.3	17	5.7		
	Asian or Pacific Islander	9	2.7	13	4.4		
Ethnicity	Other	5	1.5	16	5.4		
	Hispanic	21	6.3	31	10.6	3.83	.06
	Not Hispanic	313	93.7	261	89.4		
Marital status	Single	13	3.8	31	10.4	32.84	<.001
	Married/living with partner	242	71.4	213	71.7		
	Divorced/separated	39	11.5	45	15.2		
	Widowed	45	13.3	8	2.7		
	Did not graduate high school	22	6.6	7	2.3	14.97	.02
Education	High school graduate/GED	40	11.9	30	10.1		
	Partial college/vocational training	57	16.9	39	13.2		
	College graduate	85	25.2	104	35.1		
	Graduate degree/professional training	133	39.3	116	39.2		
Treatment status	Active treatment	245	75.6	203	70.2	2.24	.15
	Off treatment	79	24.4	86	29.8		
Comorbidity	Present	139	41.1	90	30.4	7.86	.006
	Absent	199	58.9	206	69.6		
Disease stage	In remission/not staged	18	8.8	11	5.1	5.84	.21
	Stage 1	13	6.3	22	10.2		
	Stage 2	15	7.3	22	10.2		
	Stage 3	38	18.5	45	20.9		

Demographic	Characteristics	Older group ^a (n = 339)		Younger group (n = 297)		χ^2	p
		n	%	n	%		
Primary cancer	Stage 4	121	59.0	115	53.5		
	Gynecological	47	14.1	55	18.7	55.12	<.001
	Prostate	53	15.9	38	12.9		
	Lung	68	20.4	23	7.8		
	Colon	15	4.5	37	12.5		
Past depression treatment	Yes	62	18.3	89	30.0	11.92	<.001
	No	277	81.7	208	70.0		
Current depression treatment	Yes	50	14.7	55	18.5	1.93	.20
	No	289	85.3	242	81.5		
MDD according to PHQ-9	Present	27	8.4	33	11.5	1.65	.22
	Absent	298	91.6	255	88.5		

Note. MDD = major depressive disorder; PHQ-9 = Patient Health Questionnaire-9. Younger group included participants aged 40 to 64 years, and older group included participants aged 65 years and older.

Table 2.

Model Fit of Latent Profile Models.

BLRT					
Model	BIC	Test statistic	df	p	Entropy
(A) Younger patients (40–64 years old)					
2-class	14168.37	1651.26	21	<.001	.974
3-class	13805.30	482.64	21	<.001	.931
4-class	13581.61	343.27	21	<.001	.936
(B) Older patients (≥ 65 years old)					
2-class	14432.34	1805.61	21	<.001	.979
3-class	14020.56	534.13	21	<.001	.956
4-class	13816.64	326.27	21	<.001	.938

Note. LPA = latent profile analysis; BIC = Bayesian information criterion. Bootstrap likelihood ratio test (BLRT) tests whether there is significant improvement in model fit of the tested model above and beyond to the model with one less latent class. The LPAs did not converge in either group when five or more classes were estimated, most likely due to increasing number of parameter estimates, so they are not included here.

Table 3.
Standardized Mean Differences (Cohen's *d*) of CES-D Items Between Age Groups (Younger–Older) for Each Latent Class.

CES-D item	No/low depressive symptoms	Mild depressive symptoms	Patterned response	Moderate depressive symptoms
1. I was bothered by things that usually don't bother me.	.15	.31	.30	.33
2. I did not feel like eating; my appetite was poor.	.01	.00	-.19	-.07
3. I felt that I could not shake off the blues even with help from my family or friends.	-.10	1.11	-.04	1.23
4. I felt I was just as good as other people.	-.21	-.22	-.15	.18
5. I had trouble keeping my mind on what I was doing.	.62	.26	-.39	.79
6. I felt depressed.	.27	.12	.85	1.16
7. I felt that everything I did was an effort.	.24	.54	-.11	.58
8. I felt hopeful about the future.	.07	-.12	.35	-.16
9. I thought my life had been a failure.	.27	.41	.19	1.24
10. I felt fearful.	.56	.43	.63	.46
11. My sleep was restless.	.22	.14	.40	.14
12. I was happy.	.18	-.17	-.67	.38
13. I talked less than usual.	.08	.40	.00	1.07
14. I felt lonely.	.15	.82	.03	.61
15. People were unfriendly.	.18	.01	.09	1.39
16. I enjoyed life.	.17	-.03	.06	.20
17. I had crying spells.	.09	.90	-.41	1.91
18. I felt sad.	-.12	.56	-.11	.87
19. I felt that people disliked me	.05	-.20	.60	.90
20. I could not get "going."	.13	.05	.04	.57

Note. CES-D = Center for Epidemiological Studies Depression Scale.