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The effect of mild cognitive impairment on anxiety in older adults in American and Ukraine

Eleanor Ryan

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The effect of mild cognitive impairment on anxiety in older adults in American and Ukraine

Abstract
With the growing population of elderly individuals throughout the world, the study of their emotional distress is ever poignant to society. This is especially true when these individuals have cognitive impairment. The research, in regards to Eastern European individuals, is lacking. To gain a better understanding of this understudied population, elderly people with Mild Cognitive impairment (MCI) from both Ukraine and the United States were studied. It was found that the anxiety rates of the Ukrainian MCI group were significantly higher than both the United States MCI group and the Ukraine control (p = 0.004). Purpose The purpose of this research was to examine the relationships between cognition and anxiety among individuals with MCI in Ukraine versus those in the United States. In addition to describing anxiety levels in individuals with MCI, research questions included (1) is there a difference in anxiety among individuals with aMCI vs. naMCI and (2) is there a difference in anxiety among individuals with MCI in the Ukraine versus the United States? These populations were chosen to describe what differences may be seen within a lower- middle income country and a high income country in terms of reported anxiety among individuals with MCI. Methods Participants were asked demographic questions and a Symptom Questionnaire as well as were evaluated using the Montreal Cognitive Assessment. Comparisons between anxiety and the type of MCI, amnestic (n = 90) or nonamnestic (n = 67), were made for both s MCI AND ANXIETY IN THE US AND UKRAINE groups of elderly individual as well as comparisons between Ukrainian MCI (n = 66) and control groups (11-66), and an American MCI group (n = 91). These were both community based convince samples who were recruited from a neurology clinic (American) or a primary- care network (Ukranian). Results: It was shown that there were no significant differences in anxiety levels between naMCI and aMCI groups. ANOVA comparison demonstrated that Ukrainian MCI individuals had significantly (p < 0.004) higher levels of anxiety than subjects with MCI in America and subjects without MCI in the Ukraine. There were no significant differences in anxiety levels between subjects with MCI in the United States and subjects without in the Ukraine. This being said, 10.6% (n = 7) of the Ukrainian MCI group and 4% (n = 4) American MCI group were in the substantial to severe anxiety level range while the Ukrainian

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THE EFFECT OF MILD COGNITIVE IMPAIRMENT ON ANXIETY IN OLDER ADULTS IN AMERICA AND UKRAINE

By

Eleanor Ryan

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Abstract

With the growing population of elderly individuals throughout the world, the study of their emotional distress is ever poignant to society. This is especially true when these individuals have cognitive impairment. The research, in regards to Eastern European individuals, is lacking. To gain a better understanding of this understudied population, elderly people with Mild Cognitive Impairment (MCI) from both Ukraine and the United States were studied. It was found that the anxiety rates of the Ukrainian MCI group were significantly higher than both the United States MCI group and the Ukraine control ($p = 0.004$).

Purpose

The purpose of this research was to examine the relationships between cognition and anxiety among individuals with MCI in Ukraine versus those in the United States. In addition to describing anxiety levels in individuals with MCI, research questions included (1) is there a difference in anxiety among individuals with aMCI vs. naMCI and (2) is there a difference in anxiety among individuals with MCI in the Ukraine versus the United States? These populations were chosen to describe what differences may been seen within a lower-middle income country and a high income country in terms of reported anxiety among individuals with MCI.

Methods

Participants were asked demographic questions and a Symptom Questionnaire as well as were evaluated using the Montreal Cognitive Assessment. Comparisons between anxiety and the type of MCI, amnestic ($n = 90$) or nonamnestic ($n = 67$), were made for both
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groups of elderly individual as well as comparisons between Ukrainian MCI (n = 66) and control groups (n = 66), and an American MCI group (n = 91). These were both community based convince samples who were recruited from a neurology clinic (American) or a primary- care network (Ukrainian).

Results

It was shown that there were no significant differences in anxiety levels between naMCI and aMCI groups. ANOVA comparison demonstrated that Ukrainian MCI individuals had significantly (p = 0.004) higher levels of anxiety than subjects with MCI in America and subjects without MCI in the Ukraine. There were no significant differences in anxiety levels between subjects with MCI in the United States and subjects without in the Ukraine. This being said, 10.6% (n = 7) of the Ukrainian MCI group and 4% (n = 4) American MCI group were in the substantial to severe anxiety level range while the Ukrainian control had 0% in this range. These results demonstrate the need for future exploration of this topic. The findings of this research also demonstrate the clinical significance of screening for anxiety in cognitively impaired individuals especially in those from Eastern European countries such as Ukraine.
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The Effect of Mild Cognitive Impairment on Anxiety in Older Adults in America and Ukraine.

Mild Cognitive Impairment (MCI) is a globally studied symptom set that exists through the following parameter: individuals demonstrate cognitive impairment with minimal impairment of instrumental activities of daily living (IADL) (Peterson et al., 2018). These criteria are used widely within the preexisting research and are applied within clinical classifications. Definitions of MCI are numerous and may differ depending on many factors (Stephan et al., 2008). Some are expanded to include memory impairment, commonly referred to as subjective memory complaints (SMC). This is attributed primarily to amnestic MCI (aMCI) which refers to patients who experience memory loss alongside their MCI diagnosis. Other terms have also been used such as cognitively impaired, no dementia (CIND). This relates to nonamnestic MCI (naMCI) which describes patients who report no memory problems with their MCI diagnosis. The DSM-5 refers to MCI as mild neurocognitive disorder (nMND) (Ganguli, 2011) which may also include other diagnosis beyond MCI.

Anxiety already affects 4 to 6% of the Ukrainian population, with the prevalence increasing over the individual’s lifespan (Bromet et al., 2005; Ruscio et al., 2017). In other European countries this prevalence can be seen as high as 10% in a population 65 and older (Riedel-Heller, Busse, & Angermeyer, 2006). In contrast, the anxiety levels of American individuals is about 8% (Ruscio et al., 2017) and within populations of cognitively normal older adults, 5% (Geda et al., 2008; Peters et al., 2012). This number is even higher within MCI communities.

Significance
MCI patients are more prone to psychological distress, especially anxiety, than their cognitively intact counterparts (Ausén, Edman, Almkvist, & Bogdanovic, 2009; Palmer et al., 2007). Peterson and colleagues (2018) has identified that the prevalence of MCI is 16% for individuals aged 60 years and older, which increases over age, peaking at 38%. This has been supported by other studies which show in European specific cohorts MCI has an incidence rate of 19% in populations 65 and older (Riedel-Heller et al., 2006). Up to 40% of individuals with MCI have been shown to have anxiety (Palmer et al., 2007; Taragano, et al., 2009). Beyond geographical difference, anxiety levels between aMCI and naMCI populations differ with nonamnestic populations, showing slightly higher prevalence of anxiety (Geda et al., 2008).

Similar populations have often been used to study the relationship between anxiety and MCI, primarily Western European and North American populations. Little has been done to compare anxiety levels between MCI populations from areas which are dissimilar geographically and/or socially. More specifically, the study of anxiety and MCI has been severely limited in Eastern European populations. The literature presented here involving American and Ukrainian populations will allow for the understanding of symptoms of MCI and if the treatments for MCI and the comorbid psychological symptoms can be applied to these dissimilar areas. In a clinical setting these findings could be used to inform practitioners not only of the severity of symptoms this population may face but also the prominence of these symptoms. This could motivate the practitioner to screen for psychological illness with patients with MCI. This study could also be used as a guide for future research. Eastern European studies regarding anxiety in
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MCI populations is severely limited. Using this research, future studies could work to fill this void.

Purpose

The purpose of the study of this American and Ukrainian sample allowed for the 1) report of anxiety in MCI and control populations 2) discernment of anxiety rates between aMCI and naMCI 3) differentiation of anxiety between MCI patients, dependent on geography. To address these aims, it was hypothesized that the patients with aMCI will have significantly more anxiety than naMCI populations. Also, it is hypothesized that the Ukrainian MCI population will have significantly more anxiety than the American MCI population.

Theoretical Framework

The study of anxiety within a MCI population is important. Unfortunately, there are no models which explicitly explain cognition's role in anxiety. Rather cognition must be inferred through an individuals' ability to correctly manage the stress which results from life events, life stress, and self-concept. Executive function must be used to appropriately address these concepts and therefore impairment of executive function, as seen in MCI, would increase anxiety. Use of life events, life stress, and self-concept can be seen through the model of coping developed by Pearl in, Menaghan, Lieberman, and Mullan (1981). There are many stress and coping models. Peralin and colleagues' model was chosen due to its inclusion of life stress and life events. These factors may change as a result societal influences, making it apt for answering the research questions presented here. This model claims that changes in life events, life stress, and self-concept can all lead to stress. Effective coping and strong social supports can interrupt this progression
into stress. Through the framework presented here there is a link made to anxiety by the life events, stress, and self-concept that an individual may be unable to handle as well as a normal control. This connection is made in combination with an increase in severity of unpleasant life events and stressors which may be present in Ukraine.

![Figure 1. Model of Pearlin and colleagues’ model of coping and stress (1981) as presented in Avery (2014)](image_url)

Patients with MCI may overestimate their abilities to function (Fragkiadaki et al., 2016), causing them to not seek help when it might be beneficial. Some executive function tasks (driving, telephone use, and financial management) are impaired in MCI patients when compared to cognitively normal adults (Farias et al., 2006; Okonkwo et al., 2009). Patients with MCI are often unaware of the deficits they have (Orfei et al., 2010; Vogel et al., 2004) but that does not mean that problems performing actions do not eventually cause anxiety. An individual may not be able to drive as well as another older adult and crash their car. Whether they are aware of the executive function deficit which contributed to the crash or not, this would still cause anxiety. This is only increased when the frequency of improper driving is higher than in normal older adults. This is just one
example of how the life events created by executive function deficits could increase the likelihood of anxiety. Improper knowledge of these deficits can also mean that the patients are unwilling to seek help through social supports and incorrectly respond to the situation.

Another issue is the limited resources that may be awarded to individuals. In Eastern Europe, specifically Ukraine, these social supports may be limited especially due to the political instability seen within the country (D'Anieri, 2015; Lain, 2016). This may block access to social supports while increasing life stress for all individuals but especially those with MCI. Patients with MCI may be unable to successfully access these remaining social supports as well as a cognitively normal adult would.

Literature Review

Mild Cognitive Impairment is a symptom set which afflicts many of the world’s older adult population. This being said, it was left largely unexplored until the late 1990’s. In the last 20 years the research has blossomed, expanding in volume tremendously. The aim of this review is to highlight parts of this large pool mainly responding to the questions: (1) What is MCI? (2) Is MCI worthy of independent study? (3) What is anxiety? (4) Is there a relationship between MCI and Anxiety? (5) If this relationship exists, how does it address Ukrainian populations? (6) What research has been done regarding MCI, anxiety, and Ukraine or its boarder states?

What is MCI?

Many elderly people complain of memory loss and it is considered a part of normal aging. This seemingly normative aging can, when studied carefully, follow trajectories that lead to mild cognitive impairment (MCI). This clinical condition can
effect up to anywhere from 16 to 38% of the population (Juncos-Rabadán et al., 2014; Peterson et al., 2018; Riedel-Heller et al., 2006). The definitions used for diagnosis and the resulting terminology can also be similar memory associated diseases to MCI. (Wilson, Beckett, Bennett, Albert, & Evans, 1999). Some of these include Age Consistent Memory Impairment, Age Related Cognitive Decline, Benign Senescent Forgetfulness, Cognitive Impairment No Dementia, and Mild Neurocognitive Disorder (Stephan et al., 2008). Consistent with some of these definitions, MCI is seen as intermediate of dementia. This definition was explored by Grundman and colleagues (2004). They claimed MCI is deficit in memory functions that is intermediate to the function of a normal aging person and a person with Alzheimer’s dementia (AD). This occurs without faults in other cognitive domains (Grundman et al., 2004). This transition from MCI to Alzheimer’s disease is typically consistent with definitions which focus on the presence of memory impairments (aMCI) (Schmidtke & Hermeneit, 2008). Others have contested these claims and state that MCI can exist within and outside of a dementia continuum (Peterson et al., 2018). Finally, neither of these definitions mentions a required memory loss symptom. With these components added together, there are many ways to classify MCI. It has been seen within the literature that there is use of at least 17 definitions when studying MCI (Stephan et al., 2008).

MCI can also be subtyped multiple ways. Here it is divided between amnestic MCI and nonamnestic, implying memory complaints or lack of those complaints (Peterson et al., 2018). Others have subtyped between multi-domain and single domain. This means that the patients experience multiple deficits associated with their MCI diagnosis (multi-domain) or a singular deficit (single domain) (Peterson et al., 2018).
These criteria can be combined with amnestic or nonamnestic criteria to show how many types of impairment an individual may have and whether memory problems are present. Other research have grouped individuals with presence of executive impairment (exMCI) or lack of this symptom (non-ex MCI) (Rosenberg et al., 2011). Some patients do not meet any subtype and are classified as undifferentiated (Mansbach, Mace, & Clark, 2016). These validity of these subtypes have been brought into question, which some individuals stating that all or some of the subtypes are not accurate (Han et al., 2012; Klekociuk & Summers, 2014). Although this may be true, they are still used throughout clinical practice and therefore are important for study.

Is MCI Worthy of Independent Study?

Much of the research today focuses on MCI as an etiological factor of Alzheimer's disease (AD) or other non-Alzheimer's dementias (Jicha et al., 2006) but, little concerns MCI exclusively or MCI as a stagnant state within a geriatric population. Implied progression to AD or other dementias is not always accurate. Elfgren and colleagues (2010) showed that 60% of their participants at a three year follow up had maintained their MCI diagnosis while only 27% had progressed to a dementia. These results are not anomalies. Other studies have shown that 53 to 61% of participants maintained their MCI diagnosis over similar lengths of time (Wahlund, Pihlstrand, & Jönhagen, 2003; Wolf et al., 1998). These show that the study of MCI independent of the dementia spectrum is as relevant as those that study MCI as a prodrome of dementia

MCI as a progression to dementia is shown even more so by the literature which focuses on neuropsychiatric symptoms as a marker for progression into AD (Jicha et al., 2006; Palmer et al., 2007; Rosenberg et al., 2013). Similarly to the general diagnosis, this
research does little to explain these symptoms in regards to MCI. Furthermore, many studies focus on the prevalence of depression within the MCI population rather than anxiety (Van der Mussele et al., 2013).

This improper focus on MCI caries a heavy weight within peoples' lives. People are getting diagnosed with MCI every day. Despite views regarding progression or lack thereof, the truth is by not making this a focal point there is a disservice done to individuals.

What is Anxiety?

Anxiety is described by many, including Freud, as a feeling. This emotional state included feelings of apprehension, tension, nervousness, and worry accompanied by physiological arousal (Spielberger, 2010). Similarly to MCI there are many different terms associated with anxiety, each with their own implications. The over-arching distinction of all diagnosable categories is whether there is a constant feeling of anxiety (trait) or a current anxious feeling (state) (Bernstein & Eveland, 1982). These terms have much different implications. Trait anxiety means a constant and mostly stable anxious feeling while state anxiety is influenced by “transitory situational stress” (Spielberger, 1971). In the data presented here, an anxiety state was assessed.

Is There A Relationship Between MCI And Anxiety?

Anxiety is very important factor in the lives of many individuals with MCI. These patients are more prone to anxiety, than their cognitively normal peers (Ausén et al., 2009; Palmer et al., 2007). It has been shown that the odds of having anxiety symptoms are increased by 1.43 to 16.5 for individuals having an MCI diagnosis (Yates, Clare, & Woods, 2013). Up to 40% of individuals with MCI have been shown to have anxiety
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(Palmer et al., 2007; Taragano et al., 2009). A study concerning aMCI and naMCI exclusively showed that the anxiety rate of a cohort consisting these two subtypes was 47% (Ellison, Harper, Berlow, & Zeranski, 2008). Research shows that anxiety for individuals with MCI is a primary result of their diagnosis (Frank et al., 2006). This means not only is anxiety wide spread but can be caused directly from an MCI diagnosis. These studies have been performed with primarily American or Western European cohorts (Frank et al., 2006; Palmer et al., 2007; Taragano et al., 2009). The data on people outside of these populations shows different results. A study with East-Asia cohort found the prevalence of anxiety to be 64% within MCI patients (Yatawara, Hiu, Tan, & Kandiah, 2018). This data was collected in Singapore, which is more economically sound than Ukraine.

For the individual who is diagnosed with MCI, life expectancy can be different than their cognitively normal counterparts. This disparity based on a diagnosis could explain these increased anxiety rates. Research has shown that the individuals can have almost double the mortality rate of unaffected older adults within the same age range (Guhehe, Agermeyer, & Riedel-Heller, 2006). A recent study has shown that these individuals can lose, on average, 5.2 years (male) or 7.8 (female) of their life compared to normal 70-year olds (Strand et al., 2018). This data is mixed but does show that diagnosis can carry a heavy burden for the patient. Knowing that death is potentially near could effect a patients' self-concept and be a negative life event. These have been shown through the framework created by Pearlin and colleagues (1981) to increase life stress.

If This Relationship Exists How Does It Address Ukrainian Populations?
Anxiety may be very different in countries like Ukraine, which are low- and middle-income countries (LMICs). Countries that are identified as LMIC have higher demographic instability and have less infrastructure designated to assist affected populations (Prina, Ferri, Guerra, Bayne, & Prince, 2011a). The data regarding older adults' anxiety rate is mixed within the research that studies LMIC specific cohorts (Prina, Ferri, Guerra, Bayne, & Prince, 2011b). Still little data is collected on MCI populations and their psychological distress within these populations. Even more so, the data is limited regarding a comparison between high-income countries and LMICs. Because most psychological tests are developed with populations from high-income countries, studies of differences between these populations would firm reliability.

What Research Has Been Done Regarding MCI, Anxiety, And Ukraine or its Boarder States?

One study does exist within a Ukrainian population regarding neuropsychological symptoms in MCI patients. An attempt to find research on this topic in Ukrainian border states and the ethnic groups which make up these surrounding studies was unsuccessful. The only study which regarded a similar topic to what was researched here was an exploration of mild neurocognitive disorders (MNCDs) (Levada, Cherednichenko, & Troyan, 2017). In terms of this study, the author's claim MNCDs are congruent to MCI criteria. They study this in terms of two different subtypes, Alzheimer's disease and subcortical vascular, and their relations to neuropsychiatric symptoms. It was found that one group, the Alzheimer's group, had significantly more anxiety than the cognitively normal comparison. This study does little to show MCI as we are trying to explore it. Not only does this study not focus on the MCI criteria we used, it also does not the same
subtype classification used here. This makes the results, although displaying high anxiety for one subtype, difficult to compare to this research. Unfortunately, it was the only data that could be found regarding MCI, anxiety, and Ukraine or any of its bordering states.

**Conclusion**

The information that has been collected in recent years regarding MCI has left a lot of questions in its wake. One of the leading questions is the prevalence, effect, and cause of co-morbid psychological issues. Addressing these, in particular anxiety, is important. Currently data regarding this relationship is primarily done on American or Western European countries. This leaves the majority of the world out of the equation. Furthermore, because the treatments developed for both MCI and anxiety are developed in these Western populations, the treatment may be ineffective. Beyond a cultural difference, the economic status of the Western countries studied and the countries that are not included in the research are often very different. Research done to assess this disparity could further the clinical effectiveness treatment has cross-culturally.

**Method**

Data was collected after institutional review was given on 223 adult patients 55 and older. This data was collected among both an American MCI population (US MCI) and a Ukrainian MCI population (UA MCI) and control population (UA control). Participants were excluded if they had dementia or MCI present with a significant medical or psychiatric diagnosis, for these may complicate or mask the MCI diagnosis. The individual methods for the collection of each group is specified below.

**American.** A convenience sample of 91 community dwelling adults were recruited from an outpatient neurology clinic. This included only MCI patients who were
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diagnosed by a physician with a diagnosis which was supported by neuropsychological testing. No control was used in this population. Recruitment occurred over 62 weeks and started in July 2013. Patients were identified by staff at the clinic and asked to participate in the study directly after their visit. Data collection and consent occurred with the PI, who was unaffiliated with the clinic, in an unused room at the clinic.

Ukrainian. A convenience sample of 132 community dwelling adults who were both MCI \( (n = 66) \) and non-MCI \( (n = 66) \) were used. The MCI population had a physician diagnosis which was supported by neuropsychological testing (Montreal Cognitive Assessment). Recruitment occurred in 2016 and came from a primary-care physician network which was used by all the patients. From this sample 37 were excluded by a physician based on the inclusion/exclusion criteria. The subjects were provided with a written consent form which was approved by Lviv Regional Hospital (Lviv, Lviv Oblast, Ukraine) Human Subjects Research Program.

Procedure

All groups were given MoCA (version 7.1) either to confirm eligibility (Ukrainian) or as part of the testing protocol. This protocol also included demographic survey along with The Kellner Symptom Questionnaire (SQ) (Kellner & Sheffield, 1973). This protocol was administered by the PI in both cases. More tests were administered to the American population but they were not be used in this analysis. The resulting data was combined, anatomized, and re-analyzed in specific regard to anxiety. SPSS was used in the analysis. Chi squared was used to analyze categorical variables while a one way ANOVA was used for comparison between means. Results from the
ANOVA were verified using a Tukey HSD post hoc analysis. This was approved by IRB and the PI underwent Human Subjects training.

**Instruments**

**Demographic Survey.** The demographic survey was used to assess age, gender, length of diagnosis, race/ethnicity, educational level, marital status, religious affiliation, and socioeconomic status. These all could potentially affect the psychological distress of the subject and allows for their analysis.

**Kellner Symptom Questionnaire.** The Kellner Symptom Questionnaire was used to measure psychological distress, where higher scores indicated increased psychological distress. The SQ contains 92 items, 68 of which assess symptoms of psychological distress and 24 of which are antonyms testing psychological well-being. Subscales of the SQ were also used to assess depression, anxiety, anger-hostility, and somatic symptoms. This test has been validated in English and was chosen for its largely yes/no response type along with its reliability within clinical populations with low verbal skills (Keller, 1987).

**Montreal Cognitive Assessment.** The Montreal Cognitive Assessment is used for screening for MCI. This tool is in English but has been well validated and accurately translated to Ukrainian, as well as other languages. It is particularly useful in assessing MCI because other neuropsychological tests do not have the same acuity for this subtle symptom set. In specificity, it assess attention, memory, language, visual-spatial skills, concentration, orientation, and executive functions. Lower scores on this test indicate higher levels of cognitive impairment. The MoCA was chosen for his high validity and sensitivity.
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All three tests were given in English to the American population. Both the demographic survey and the SQ were translated from English into Ukrainian by a certified translator, and were translated back into English by a separate certified translator to ensure accuracy. These were administered the Ukrainian population along with the MoCA which had been previously translated.

Results

Of the population of 223 adults included within our study 89 were male (US MCI = 89, UA MCI = 22, UA control = 11), 116 were female (US MCI = 35, UA MCI = 35 UA control = 46), and 18 were unspecified (US MCI = 0, UA MCI = 9, UA control = 9). There was a significant difference in the ratio of men than women among the groups included, primarily seen within the US MCI population, $\chi^2(4) = 39.92$ ($p < 0.001$).

Within the two MCI groups 67 had naMCI symptoms (US = 39, UA = 28) while the other 90 had aMCI (US = 52, UA = 38). Overall, there was not significantly more individuals with naMCI than aMCI in the US MCI vs. UA MCI groups, $\chi^2(1) = 0.003$ ($p = 0.957$). Minimum age within all groups was 54 with the maximum being 89. Analysis demonstrated that a significant difference among the groups in terms of age, $F(2) = 48.77$ ($p < 0.001$). Tukey HSD showed that the US MCI and UA control were significantly different in age ($MD = 11.74$, $p > 0.001$), along with US MCI and UA MCI ($MD = 8.45$ $p < 0.001$). UA MCI and UA control were also significantly different in age ($MD = 3.29$, $p = 0.041$). Minimum education within all groups was 4 years with a maximum of 35 years, $F(2) = 4.39$ ($p = 0.014$). Post hoc analysis via Tukey HSD showed that education was not significantly different between UA MCI and UA control ($MD = 1.35$, $p = 0.075$) and
between US MCI and UA control \((MD = 0.28, p = 0.876)\) but was between US MCI and UA MCI \((MD = 1.63, p = 0.013)\).

### Table 1. Participant Demographics.

<table>
<thead>
<tr>
<th>Demographic</th>
<th>MCI US ((n = 124))</th>
<th>MCI UA ((n = 66))</th>
<th>Control UA ((n = 66))</th>
<th>Significance Test ((\chi^2))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender *</td>
<td></td>
<td></td>
<td></td>
<td>(p &lt; .0001)</td>
</tr>
<tr>
<td>Male</td>
<td>89</td>
<td>22</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>35</td>
<td>35</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Unspecified</td>
<td>0</td>
<td>9</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>MCI Type</td>
<td></td>
<td></td>
<td></td>
<td>(p = .957)</td>
</tr>
<tr>
<td>naMCI</td>
<td>39</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>aMCI</td>
<td>52</td>
<td>38</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(\text{Note: } *p<0.05\)

Beyond demographics other results were analyzed to test the hypotheses presented. As expected, MoCA total scores were different between the test groups and the control, \(F(2) = 61.45 \ (p < 0.001)\). Tukey HSD showed that a significant difference exists between US MCI and UA Control \((MD = 4.55, p < 0.001)\) and UA MCI and UA Control \((MD = 5.45, p < 0.001)\), as was expected. MoCA scores did not vary significantly between the MCI populations \((p = 0.168)\). MoCA total scores were also compared between MCI types and control. This showed, unsurprisingly, that there were significant differences among the groups, \(F(2) = 59.13 \ (p < 0.001)\). Tukey HSD showed that there was a significantly different MoCA scores between the control and both the naMCI \((p < 0.001)\) and the aMCI \((p < 0.001)\) populations. The MoCA scores in the naMCI and aMCI \((p = 0.106)\) were not significant.

Anxiety in terms of a total anxiety subscale was also found to be significantly different among the three groups, \(F(2) = 6.16 \ (p = 0.003)\). Post hoc analysis showed that
significant difference occurred between US MCI and UA MCI ($MD = 2.57, p = 0.014$) and between UA MCI and UA Control ($MD = 1.19, p = 0.007$) but not between the two US MCI and UA Control ($p = 0.896$). Overall, an ANOVA comparison demonstrated that UA MCI had significantly higher anxiety than US MCI and UA control ($p = 0.004$). Clinical anxiety was also considered and broken up into normal, moderate, and substantial-severe and considered with both location and MCI type. There was not a significantly different number of individuals in each category in either the MCI US, MCI UA, or control UA groups $\chi^2(8) = 12.20 (p = 0.14)$. Although none of these proved statistically significant it should be noted that none of the controls tested within the substantial-severe range (See Figure 2). In fact, 10.6\% ($n = 7$) of the UA MCI group and 4\% ($n = 4$) US MCI group were in the substantial to severe anxiety level range. Further divide into subtypes and location the percentages of participants who were in the substantial-severe range are as follows: UA naMCI 14\% ($n = 4$), UA aMCI 8\%, ($n = 3$), US naMCI 6\%, ($n = 3$), and US aMCI 3\% ($n = 1$).
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Figure 2. Severity of reported anxiety symptoms in MCI patients according to location and subtype

Discussion

Anxiety in terms of MCI throughout the world is an important area of study. The aims of this study was as follows: (1) describing anxiety levels in individuals with MCI and those in a control population, (2) finding a difference, if present, in anxiety among individuals with aMCI vs. naMCI, and (3) analyzing reported anxiety among individuals with MCI in the Ukraine versus the United States.

Aim One

The anxiety levels of those with MCI in the United States was not significantly different. The UA MCI group had the highest anxiety level and did vary significantly from these two groups. This is a surprising result, it was hypothesized that both the UA and US groups would have greater anxiety than the control. Theories surrounding these results are explained under Aim Three.

Aim Two

The aMCI and naMCI subtypes did not vary in anxiety, despite the location of the participants. This result did not support out hypothesis, though it is congruent with research done previously in similar populations (Rosenberg et al., 2011; Rozzini et al., 2008). The goal of this aim was to assess whether cultural, economic, or geographical influence may affect one subtype, in terms of anxiety, more than the other. These results show that these factors did not significantly affect the reported anxiety rates of one subtype compared to the other. These results could also mean that there was a mediating
variable, like chronic illness, brain injury or others, which were not accounted for in the data.

**Aim Three**

The relationship, in terms of anxiety, between the UA MCI group and the UA control group was expected. As shown in previous studies, MCI groups have significantly more anxiety than control groups when the data is collected in similar populations (Palmer et al., 2007; Peters et al., 2012). This data is congruent with the research done here. There is, unexpectedly, a significant difference in reported anxiety between US MCI and UA MCI. On the same note, there is no significant difference between US MCI and UA control. To explain these anomalies I present three theories: inability to access materials to assist symptom management, increased death related anxiety, and inability for the Symptom Questionnaire to account for cultural variance.

The first of which relates to the access to materials an individual may need to successfully manage their MCI diagnosis. Individuals with MCI often have damaged executive function which results in impairment of some tasks (Farias et al., 2006; Okonkowo et al., 2009). Beyond this, the individuals may have significantly different perception of their deficits than a cognitively normal control (Orfei et al., 2010; Vogel et al., 2004). Because these deficits are there, and the individual may not have accurate perception of them, they may not harness the resources that are available to them. This could leave the individual facing problems that they are unprepared for and cannot accurately attribute to a deficit. These life events that cannot be appreciated normally can cause undue anxiety in an individual's life. This may affect all individuals with MCI and cause them to have more anxiety than controls, as seen in the literature (Ausén et al.,
2009; Palmer et al., 2007). Increased anxiety is exaggerated even more when the person has less access to help because of a lack of government supplied resources. This is seen predominantly within countries classified as LIMCs, which includes Ukraine, because these governments have less systematic facilities designed to assist these populations.

This may affect the Ukraine even more than most LIMCs because the political instability the country is currently facing (D'Anieri, 2015; Lain, 2016). Through this lack of resources and improper recognition of personal need for resources, the difference between anxiety rates between MCI populations and control populations can be expected.

It can also be seen that the UA MCI population will have the most anxiety reported throughout all the groups assessed which is also seen within the data.

This conclusion lays into the next theory for why we see similar anxiety rates among MCI groups in the United States and Ukraine. This deals with the mortality rate that may increase anxiety. Individuals with MCI have increased mortality rates when compared to cognitively normal older adults (Guehne et al., 2006; Strand et al., 2018).

Individuals also have increased mortality rates when they experience life stress, lack of social supports, and other factors that may lead to disease (Wilkinson & Marmot, 2008). These, as previously mentioned, effect the Ukrainian population more than the American population due to political and economic unrest in Ukraine. This concludes that the UA MCI population has the greatest potential mortality rate among the groups tested. This is shown because it has increased mortality rate through both means explained, presence of MCI diagnosis and increased life stress and lack of social supports. Anxiety along with other psychiatric disorders can result from knowledge of the death due to chronic illness (Shepherd et al., 1964). These results imply that increased mortality rate can lead to
increased anxiety. This study by Shepherd and colleagues has been expanded on to include knowledge of increased death-related anxiety within populations with dementia (Wilson et al., 2007). If MCI is considered an intermediate of dementia, the psychological symptoms experienced should also follow this similar trajectory (Lyketsos et al., 2002). So, if dementia patients have increased death-related anxiety and MCI is an intermediate of dementia then death-related anxiety should be increased in MCI populations too. This should prominently affect populations which have increased mortality rates, like the UA MCI group. It has been shown that this group has significantly more anxiety than both the US MCI and the UA control, therefore supporting this theory.

Finally, my last proposed theory is that the methods used here do not account for cultural variance. The results show that the MoCA test still correctly identifies MCI and control populations. The results from the Kellner Symptom Questionnaire do not show the results expected. The MCI groups did not show similar results, while the control group and the US MCI group did. This may mean that the test, although there was an attempt to maximize validity via independent translation, did not collect information from the Ukrainian participants in the same way it did in the American population. This may mean that the tests is not valid in Ukrainian or that the test does not accurately assess the anxiety symptoms the Ukrainian population may face.

Addition Analysis. It is apparent that there is a need to explore potential mediating or moderating variables that may explain the differences in the anxiety of the UA MCI and US MCI groups. To accomplish this, hierarchical regression modeling only including the MCI participants was used to predict anxiety while controlling for these variables. The regression modeling suggests that when accounting for gender and overall
cognitive level, the location of subjects (UA vs. US) is not predictive of their anxiety. This indicates that the difference in anxiety between the UA and US MCI groups may be related to the significant differences found between the demographic variables of the groups. See table 2. The first two theories presented above explain that the location should be a significant predictor of anxiety. Therefore, these results support the third hypothesis presented. This claims that the anxiety symptoms faced by both the UA populations were not properly assessed through the tests given.
Table 2. Regression Modeling among Location and Anxiety while Controlling for Age, Gender, Years of Education, and Cognitive Level (MoCA total).

<table>
<thead>
<tr>
<th>Variables(^1)</th>
<th>Anxiety</th>
<th>(B) (SE)</th>
<th>(\beta)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>9.28 (2.88)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.04 (0.03)</td>
<td>-0.07</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>1.19 (0.52)</td>
<td>0.16*</td>
<td></td>
</tr>
<tr>
<td>Years of Education</td>
<td>-0.14 (0.09)</td>
<td>-0.11</td>
<td></td>
</tr>
<tr>
<td>(R^2) Change</td>
<td>0.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(F) Ratio for (R^2) Change</td>
<td>4.19**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>15.50 (3.86)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.07 (0.04)</td>
<td>-0.13</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>1.26 (0.51)</td>
<td>0.17*</td>
<td></td>
</tr>
<tr>
<td>Years of Education</td>
<td>-0.11 (0.09)</td>
<td>-0.08</td>
<td></td>
</tr>
<tr>
<td>MoCA Total</td>
<td>-0.20 (0.09)</td>
<td>-0.17*</td>
<td></td>
</tr>
<tr>
<td>(R^2) Change</td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(F) Ratio for (R^2) Change</td>
<td>5.75*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>15.32 (3.84)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.04 (0.04)</td>
<td>-0.07</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>1.01 (0.53)</td>
<td>0.14</td>
<td></td>
</tr>
<tr>
<td>Years of Education</td>
<td>-0.09 (0.09)</td>
<td>-0.07</td>
<td></td>
</tr>
<tr>
<td>MoCA Total</td>
<td>-0.21 (0.09)</td>
<td>-0.18*</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>-1.24 (0.76)</td>
<td>-0.13</td>
<td></td>
</tr>
<tr>
<td>(R^2) Change</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(F) Ratio for (R^2) Change</td>
<td>2.65</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)Note: Location coded as Ukraine = 1, USA = 2. Gender was coded as Male = 0, Female = 1, and Not Specified = 2. All groups (MCI and Control) included in the analysis.

\(*p \leq 0.05, **p \leq 0.01, ***p \leq 0.001\)
This research brings many issues into the light. Firstly, these issues draw to light the need for future research. One of the issues lay in the lack of research done with a MCI population in Ukraine. Currently there is one study which focused on a Ukrainian MCI population and the anxiety they may face (Levada et al., 2017). There was an attempt to look into research done in surrounding states or within specific ethnic populations that exists in these countries. Again, no research could be found. This means this study functions to a draw attention to the lack of work done with this population and spark interests regarding this individuals. There is also need to do research in dissimilar countries which have different cultures, economies, and geographic locations. This could help define what measures which are developed and currently in use in one population could be most beneficial to the other. For example, this could be used to motivate a validation of the SQ in Ukrainian. This leads to the second implementation of the findings here, a clinical setting. These findings highlight the need to screen MCI patients for anxiety. These individuals could feel anxiety for a variety of reasons and identification of these issues, despite their nationality, is beneficial to them. Furthermore, these findings could be used to inform practitioners of prevalence of anxiety symptoms and how these may be different in particular populations.

Limitations

Primarily the limitations occur with mediating variables. There may be unassessed variables which were unable to be accurately translated to and from Ukrainian to be included here. This includes a variety of questions given as part of the demographic survey. Beyond this, there could be unaccounted variables like brain injury or chronic illness. There is also a possibility for inaccurate translation of items in the SQ and the
demographic survey that were included within the data analysis. These effects were minimized by independent translation but could potentially still effect results. There could also be more data published regarding Ukrainian and other Eastern European populations which could have guided the research performed here. The data review done for this analysis was limited to articles written in English, excluding articles which could have been influential.

Conclusion

In summary, there was a significant difference between MoCA scores between MCI and control populations. There was also not a significant difference between anxiety rates between aMCI and naMCI. There was a significant difference in the anxiety rates between the US MCI and UA MCI groups while there was no significant difference between US MCI group and UA control. This can be explained through limited use or availability of help, increased death related anxiety, or, an inability to accommodate cultural variance. These results could be used to motivate research in this area and demonstrate the significance of screening to clinicians. There is also a clinically different type of anxiety within the MCI group. Both US and UA MCI groups have anxiety within the substantial-severe range.
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