The Association of Psychological Distress and Mental Health with English Language Acquisition of Recently Resettled Refugees in the United States

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THE ASSOCIATION OF PSYCHOLOGICAL DISTRESS
AND MENTAL HEALTH WITH ENGLISH LANGUAGE ACQUISITION
OF RECENTLY RESETTLED REFUGEES IN THE UNITED STATES

by

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ABSTRACT

Host country language proficiency among resettled refugees has been associated with better mental health; yet, in qualitative studies, refugees describe psychological distress acting as a barrier to their learning. To clarify varying results, this longitudinal study of refugees from Africa, the Middle East, and Afghanistan (n=290) examined language acquisition with positive mental health and psychological distress as distinct concepts on correlated unipolar dimensions (Keyes 2002; Rumbaut 1989). With multilevel modeling, initial English speaking ability was significantly related to increasing positive mental health over time, indicating host country language proficiency acts as a protective factor for refugees, and supporting the growing body of research demonstrating the impact of social determinants on mental health. In contrast, refugees’ initial levels of English proficiency were not significantly related to changes in psychological distress, nor was initial psychological distress related to English acquisition over time. These findings indicate a lack of support for the hypothesis that psychological distress acts as a barrier to English acquisition and further corroborate growing evidence that positive mental health and psychological distress are related, but are not opposites on a single continuum. Higher levels of education and younger age were positively related to both higher initial English levels, and also increased rates of language acquisition. Although women initially had lower mean levels of English proficiency, their language learning growth rates were parallel with their male counterparts, a new finding with this wave of refugees.
Introduction

Evidence from empirical research has been mounting that supports the conceptualization of mental health and psychological distress as related, but not polar opposites on a single continuum (Huppert and Whittington 2003; Keyes 2005; Payton 2009; Ryff and Singer 2000). They appear to occupy separate unipolar dimensions, which supports the view that mental health is more than the mere absence of disorder. The World Health Organization (WHO) defines mental health as “a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community” (WHO 2018). Mental health is not just a lack of psychopathologies, and in fact, not all who are free of mental illnesses are flourishing or completely mentally healthy – they may be languishing (Keyes 2005). Mental health can be analogous to physical health, in that one can have poor physical health but not necessarily have a physical illness. Similarly, one can be languishing and not have a mental illness.

Conflating distress, disorder and positive mental health ultimately obscures the interrelated, yet independent constructs (Payton 2009). In practice and in the literature, the distinctions are not always clearly articulated and the resulting implications are either not noticed, glossed over, or misrepresented (Rumbaut 1989, 1991). For a complete picture of psychological health, measures of positive mental health are designed to evaluate levels of flourishing and feelings of subjective well-being, and in contrast, assessments of psychological distress measure feelings of depression and anxiety (Keyes 2005; Ryff and Singer 2000; Ryff and Keyes 1995). Increasingly, researchers are exploring these constructs with a wide variety of

This longitudinal research with a sample of 290 refugees resettled in the United States is designed to provide insights into the distinct concepts of psychological distress and positive mental health by exploring their directional relationships with English language acquisition. Recently resettled refugees are highly motivated to learn the host-country language and are often under acute distress during the transition to a new country, but have also often demonstrated resilience (Beiser and Hou 2001; Kim 2016; Marshall, Schell, Elliott, Berthold, and Chun 2005; Zhang, Hong, Takeuchi, and Mossakowski 2012); thus both psychological distress and positive mental health may be significantly related to and affected by acquiring host country language proficiency.

Literature Review

Mental Health, Psychological Distress, and Disorder on Separate Continuums

Within a positive psychology framework, mental health is conceptualized as a positive phenomenon and is defined as more than the mere absence of disorder or mental illness (Westerhof and Keyes 2010). Henry Sigerist wrote in Medicine and Human Welfare (1941), “Health therefore is not simply the absence of disease; it is something positive, ...” (Sigerist 1941:100). Correspondingly, the World Health Organization (WHO) defined overall health in 1948 as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”
(World Health Organization 2018). In the ensuing decades, these concepts when applied to psychological health have also altered understandings of mental health, psychological distress and mental illnesses.

Keyes (2002; 2005) advanced the dual continua model in which well-being and psychopathology are two related, but distinct dimensions of mental health. Keyes (2002) posited that mental health was “a syndrome of symptoms of positive feelings and positive functioning in life” and described it as similar to diagnosing depression from the Diagnostic and Statistical Manual of Mental Disorders (DSM) (Keyes 2002:207). In Keyes’ model of flourishing, “the presence of mental health is described as flourishing, the absence of mental health is characterized as languishing” (Keyes 2002:208). “Flourishing individuals have enthusiasm for life and are actively and productively engaged with others and in social institutions” (Keyes 2002:262), whereas, languishing is a condition in which life seems empty or stagnant, “a life of quiet despair” (Keyes 2002: 210). Keyes (2004) also noted that “languishers” are at greatly increased risk of major depressive episodes and physical conditions such as cardiovascular disease.

Researchers, including Payton and Keyes, recommend that investigators of health outcomes include measures of positive well-being and quality of life assessment, as well as mental illness and psychological distress in order to completely and accurately portray overall health status (Huppert and Whittington 2003; Yoo and Kahng 2019). Subsequent investigations have branched out to include studies of the dual continua model, with many researchers working with clinical samples and comparing mental health with the disorder in question in many different communities, such as Canadian adults (Gilmour 2014); South African
adults (Keyes et al. 2008); Dutch adults (Lamers et al. 2011); Argentinian adults (Perugini et al. 2017); Italian adults (Petrillo et al. 2015), and Korean adolescents (Yoo and Kahng 2019).

Limited research has explored these different dimensions of mental health among refugee populations with a notable exception of the Indochinese Health and Adaptation Research Project (IHARP), a longitudinal study of almost 500 Southeast Asian refugee households in 1983 and 1984 (Rumbaut 1991, 1989; Vega and Rumbaut 1991). In measuring affective symptoms of happiness and distress, the researchers noted that depression (dysphoric symptoms and a sad, anxious, and depressed mood) and happiness (cheerful sense of positive affect and well-being) were inversely correlated, but that they tapped into different psychological dimensions of the broader well-being measure. They pointed out that when the two components are aggregated into a single general well-being (GWB) score, the dual and more discriminatory characteristics tended to be concealed (Rumbaut 1989). In a subsequent study with the same sample, Rumbaut (1991) also assessed refugees’ psychological well-being in terms of life satisfaction, which he described as a cognitive rather than affective appraisal of well-being. Again, Rumbaut (1991) emphasized that distress and life satisfaction are not opposite dimensions of a single scale, but rather measure very different psychological processes. Although the importance of understanding these multiple dimensions of mental health among refugee populations was recognized more than 30 years ago, most research with refugees has focused on distress and pathology. Thus, a more comprehensive understanding of refugee mental health, disaggregating life satisfaction and happiness measures from psychological distress expands research findings to those
that are not solely deficit-focused. The current research furthers the inquiry into mental health and psychological distress with a sample of recently resettled refugees who have arrived in the United States during the most recent world-wide refugee crisis.

Background: Refugee Crisis

The current refugee crisis marks the largest involuntary movement of the human population since World War II – 70.8 million people have been displaced from their homes as of data gathered in 2018 (UNHCR 2019, Gatrell 2013 – see Appendix A for comparisons). With the total world population of 7.4 billion people, this means one in every 105 people is now either a refugee, an asylum seeker, or internally displaced within their own country\(^1\) (UNHCR 2019). The impact of this refugee crisis will reverberate throughout the world for decades, primarily in the regions currently plagued by war and violence, such as Syria and Iraq, and Afghanistan (UNHCR 2015, 2016, 2017, 2018), and also in the neighboring nation states which are struggling to absorb hundreds of thousands of – and in some cases, over a million – people seeking refuge\(^2\). In addition, many people are risking their lives to flee from the Middle East and North Africa to the European Union in the hopes of restarting their lives in safety, and the European nations are grappling with

\(^1\)Definitions of the 3 legal types of displaced people: 1) internally displaced persons (IDPs) have not crossed an international border, and seek refuge within their own country wherever they can, but they are not protected by international law, nor eligible to receive many types of aid, because they are legally under the protection of their own government; 2) asylum-seekers are people who have fled their own country for sanctuary in another country and are applying for refugee status; 3) refugees have been granted refugee status by the United Nations, because they have been able to prove their fear of persecution in their home country is well-founded (UNHCR 2017).

\(^2\)According to the UNHCR (2017), the top 3 resettlement countries are Turkey (2.9 million), Pakistan (1.4 million), and Lebanon (1 million), which together account for 30% of UNHCR-registered refugees globally. Developing countries host 86% of the world’s refugees (Amnesty International 2017).
how to respond to the unprecedented numbers crossing their borders. A small percent of refugees are resettled to third countries after being vetted by the United Nations High Commissioner for Refugees (UNHCR), so the dispersion of refugees throughout the world will also have significant long lasting implications in more distant countries, although not nearly as immediate, chaotic, or concentrated an impact as on the more proximate neighboring countries.

Of the 70.8 million forcibly displaced persons in the world currently, approximately 20.4 million have been granted official refugee status by the UNHCR, which bases decisions on the rules of international law initially set forth at the 1951 Convention Relating to the Status of Refugees and the 1967 Protocol, and further expanded by the 1984 Cartagena Declaration in response to conflicts and violence in South and Central America. The definition of a refugee was initially centered on a well-founded fear of persecution for reasons of race, religion, nationality, membership of a particular social group or political opinion (Article 1 A 2 of the 1951 Convention), and now also includes people who have fled their country because their lives, security, or freedom have been threatened by generalized violence, foreign aggression, internal conflicts, massive violation of human rights, or other circumstances which have seriously disturbed public order (UNHCR 2010, 2013, 2017, 2018).

Although violence and political turmoil have caused human displacement for centuries, the international acceptance of refugee status has resulted in programs of refugee assistance that are governed by regimes of intervention (Gatrell 2013). Three solutions for refugees to reestablish their lives have been identified by the United Nations: 1) to voluntarily repatriate back to their home country, 2) to remain and
integrate into the country to which they have fled, or 3) to be resettled in a third country (UNHCR 2017). A core principle of the U.N. Declaration on the Rights of Refugees is non-refoulement – in other words, a person should not be returned to a place where they face serious threats to their life or freedom – which means that many refugees are unable and cannot be forced to return to their home country. Yet, they are often left in an indeterminate state – unable to gain legal work and become part of society in the neighboring country in which they have come to reside. The third solution, however, is only used in a small portion of cases – in fact, in 2015, of the 16.1 million refugees, fewer than 1% were resettled to a third country (UNHCR 2015). This has been deemed a less desirable option than the other durable solutions, in recognition of the extreme life dislocation of moving to a culturally- and linguistically-distant society. The number of countries accepting refugees for resettlement or providing humanitarian admissions has expanded in response to the current crisis and, as of 2017, totals 37 (UNHCR 2017).

The Refugee Experience: Trauma and Resettlement Stressors

The risk of psychological distress and PTSD for each individual refugee varies depending on their exposure to pre-migration traumatic events, as well as the

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3 Humanitarian admission is the process of third countries granting short-term residence to groups of individuals from vulnerable refugee populations in order to provide temporary protection on humanitarian grounds. The ongoing need for protection will then be reviewed in the future. Whereas, refugee resettlement is defined by UNHCR as ‘the selection and transfer of refugees from a state in which they have sought protection to a third country that admits them – as refugees – with a permanent residence status’ (UNHCR 2017).

4 The nations accepting refugees as of 2017 included many European nations; Australia and New Zealand; in South America - Argentina, Brazil, Chile, and Uruguay; in Asia - Japan and the Republic of Korea; and in North America - Canada and the United States. The United States is the leading third-country resettlement destination in raw numbers and usually one of the top three receiving nations when ranked per capita. In fiscal year 2016, the United States received the most refugees: 84,994 of the 125,600 individuals resettled to a third-country; followed by Canada, the U.K., Australia, and France.
stressors during their flight, and during their post-migration settlement (Lindencrona, Ekblad and Hauff 2008; Schweitzer, Melville, Steel, and Lacherez 2006). Some researchers have found that greater prior exposure to trauma has a dose-response relationship with increased psychological distress and psychosocial dysfunction, though, an increase in time elapsed since the last traumatic event lessens the risk of mental disorder (Steel, Silove, Phan and Bauman 2002). After five years, those reporting exposure to one or two traumatic events had similar risk of mental illness as those who reported no exposure to traumatic events; however, refugees who reported three or more traumatic events had a higher frequency of mental illnesses than the other groups, even ten years later, though it also decreased over time (Steel, Silove, Phan and Bauman 2002).

In contrast to the dose-response relationship of trauma found in earlier research, a study using a sample from the U.S. census (2002-2003) of Latino and Asian refugees and immigrants found that post-resettlement trauma and stressors, including limited English proficiency, unemployment and everyday discrimination, were significantly associated with mental health outcomes, but surprisingly, prior trauma exposure was not (Kim 2016). Kim (2016) speculated that the pressures of resettlement may take precedence over more temporally distant traumas. Refugees often experience disrupted family and cultural systems in the new environment, as well as separation from family and their home community (Schweitzer, Melville, Steel, and Lacherez 2006). Frequently refugees encounter actual and perceived structural and sociocultural barriers to their safe and swift transition into the new country offering safe haven (Marshall et al. 2005; Stein 1981). In addition, refugees’ expectations of their new life are often not realized – many are unable to maintain
their prior employment status and do not feel secure in their new community (Stein 1981). Refugees may be re-traumatized by poverty, social isolation, loss of important social roles, loss of cultural and social traditions, a hostile legal or incomprehensible bureaucratic system, and anti-immigrant or racist attitudes exhibited by host country nationals (Stein 1981).

**Language acquisition**

To reestablish their lives on arrival to a new country, acquiring the language skills necessary to function is fundamental for refugees (Castañeda, Holmes, Madrigal, DeTrinidad Young, Beyeler, and Quesada 2015; Marshall et al. 2005; Stein 1981; Warriner 2016). When refugees are excluded from social interactions due to an inability to communicate, they are unable to access the social stock of knowledge shared through human interactions, nor are they able to accumulate shared experiences within their new society (Berger and Luckman 1966:41). In order to avoid this marginalization, refugees need to master the host country language which may increase self-efficacy and self-esteem, as well as employment options, the ability to support children in school, and access to healthcare and education (Braveman, Egerter, and Williams 2011). Researchers report that higher English proficiency contributes to better mental health among refugees and position English proficiency as a protective factor (Fazel, Reed, Panter-Brick, and Stein 2012; Reed, Fazel, Jones, Panter-Brick, and Stein 2011). Correspondingly, research with refugee populations over the past 30 years has shown that low levels of English proficiency among refugees and immigrants are associated with a greater risk of mental health problems in the long term (Beiser and Hou 2001; Kim 2016; Marshall et al. 2005;
Søndergaard and Theorell 2004; Zhang et al. 2012). In this prior research, little distinction was made between positive mental health and psychological distress as separate constructs – often the implicit assumptions were that they are on a single continuum. Repeatedly there has been strong evidence that host country language abilities act as a protective factor, but less is known about whether psychological distress inhibits cognitive processing needed for learning a new language.

Psychological distress as a barrier to language acquisition

In qualitative research, refugees have described their emotional distress as acting as a barrier to language retention (Salvo and de C Williams 2017; Sulaiman-Hill and Thompson 2012). Three studies with refugee populations in particular have linked an inability to learn with a concept that appears to be similar to cognitive lockout, or the inability to learn when under stress (Oehlberg 2006). The theme of “thinking too much” emerged from Sulaiman-Hill and Thompson (2012) mixed method exploratory study of resettled refugees in Australia. They quoted an Afghan refugee who had immigrated seven years previously: “Everything hurts us, this is why we can’t learn things, we are physically in class but the mind is elsewhere” (Sulaiman-Hill and Thompson 2012:73). This disclosure appears to identify psychological distress as a barrier to being able to absorb new information and learn English. In another study which included barriers to learning, the researchers reported that a refugee in the U.K. said, “my mind is not in peace to learn” and reported difficulties concentrating and remembering the content of the classes (Salvo and de C Williams 2017). In a third study, the term “thinking a lot” was used to describe a person’s negative cognitions which could trigger several types of psychological and somatic distress, including poor concentration, racing thoughts,
‘zoning out’ and headaches (Hinton, Barlow, Reis, and de Jong 2016). Although these symptoms appear to overlap with those of the previous two studies, the ‘thinking a lot’ network model of psychopathology presented by Hinton, Barlow, Reis, and de Jong (2016) may represent more severe psychological difficulties than some language learners experience when they describe simply being unable to concentrate. Interestingly, Hinton and colleagues (2016) found that “thinking a lot” most often involved current life concerns, indicating the chronic stress of poverty and resettlement may be more significant to respondents than the biological and psychological toll of past trauma. Thus, these findings from several studies suggest that psychological distress may act as a barrier for refugees’ language acquisition (Hinton, Barlow, Reis, and de Jong 2016; Ryan, Dooley and Benson 2008 [Ward 2002]; Salvo and de C Williams 2017; Sulaiman-Hill and Thompson 2012).

Process of Language Learning

Learning a new language can be divided into five stages: preproduction within the first six months of arrival, early production from six months to one year, speech emergence during years one to three, intermediate fluency occurring in years three to five, and finally advanced fluency after year five (Krashen and Terrell 1983). Thus, with no prior exposure to speaking English, refugees within the first three years of arrival are typically in one of the first three stages, preproduction, early production, or speech emergence. Then, by the third year, given ideal learning environments, refugees may begin to develop intermediate fluency.

In addition, when learning a new language, a person is not just learning words, grammar, and syntax, but also learning a new mindscape (Zerubavel 1997). Research has shown that acculturation is additive – as refugees and immigrants
become bilingual and bicultural, their core linguistic and cultural mindset is not replaced, but remains tied to their heritage culture (Donitsa-Schmidt 1999; Epstein and Kheimets 2000; Olshtain and Kotik 2000). Thus, a refugee learning the new language of a host country needs to be open and ready to add another mindscape with new social conventions, distinctions, and cognitions to their existing perceptions of reality. It is possible that refugees’ mental health status may impact their capacity and readiness to engage in these processes.

Factors Related to Language Acquisition: Gender, Education, Age

In general, acquiring basic, context-dependent communication skills often takes two years for the average language learner with appropriate supports (Cummins and Davison 2007), and the process of learning another language is influenced by a variety of factors such as first language literacy, type of instruction with familiar contexts and visual cues, and number of opportunities to speak the language (Hill and Flynn 2006). In addition, research with refugees has found that the three characteristics of gender, educational background, and age at arrival are consistently shown to be related to language acquisition.

Interestingly, there are gender differences in mastering another language, which have been shown to vary by the area of the world from which immigrants originate. Research using the 1980 and 1990 U.S. Census indicates that overall, foreign-born women in the United States are slightly more likely to be fluent in English than foreign-born men, especially those from East Asian and European countries; however, women originating from South Asia, Africa, Latin America, and the Middle East are less likely to be as fluent as their male counterparts (Carliner 2000). This lack of fluency has been attributed to these female immigrants and
refugees being less likely to participate in the formal labor market (Beiser and Hou 2000; Pavlenko, Blackledge, Piller, and Teutsch-Dwyer. 2001; Remennick 2003). Often, a gendered division of work confined women to the home, with pregnancy and child-care taking precedence over attending language classes (Liversage 2009). In some cultural groups, gendered norms are thought to dissuade some women from attending mixed-gender classes (Bloch 2002). Other researchers have also attributed the language acquisition disadvantage of some women to their lower levels of prior education as compared to their male counterparts (Bloch 2002).

In fact, refugees of both genders with limited previous education are less likely to become proficient in speaking English (Beiser 2009; Espenshade and Fu 1997). For those with less exposure to formal education, learning skills and strategies may be new behaviors to master, in addition to the language and cultural norms. In a study using video-recordings of classroom behavior, Ramírez-Esparza, Harris, and Hellermann (2012) found that adult learners of English with little formal education demonstrated a need to learn the socio-interactive practices of what to pay attention to and how to participate in formal classrooms. Researchers also noted that the immediate needs concerning housing, health, and situating children often deflected refugees’ attention and recommended that language courses need to accommodate these pressing issues of resettlement, by being less intensive and offered for longer periods of time (Rose 2015).

Age has also shown to be a factor in English-speaking ability of refugees and immigrants to the United States and Canada (Hou and Beiser 2006, Remnick 2004). Children who attend school achieve the greatest proficiency in the shortest period of time. In contrast, an older age at resettlement is often correlated with lower levels of
English proficiency (Beiser and Hou 2001; Espenshade and Fu 1997; Remennick 2003). Thus the three characteristics of female gender (from specific regions of the world), older age, and less formal education have been indicators in previous waves of refugees of those with greater risk of not achieving fluency in the host country language (Beiser 2009; Beiser and Hou 2000; Carliner 2000; Cruel and Vermeulen 2003; Espenshade and Fu 1997; Hou and Beiser 2006; Sulaiman-Hill and Thompson 2012).

Research Rationale

In summary, psychological distress has been reported by refugees in qualitative research as acting to block their ability to learn the language of their host country; nonetheless, by ten years after resettlement in English speaking countries, many refugees have become proficient English speakers and were reported to be integrated into the host country society (Beiser, and Hou 2001; Rose 2015). However, researchers have found that low host country language proficiency a decade after arrival was a significant predictor of depression and low or lack of employment (Beiser, and Hou 2001).

In the literature, researchers primarily approach the acquisition of the host-country language as an expedient to gaining employment and therefore easing the stressors of psychological adjustment to the new society. However, psychological distress has not been investigated as an impediment to language acquisition over time. In addition, positive mental health is understood as a protective factor for refugees, but its impact on language learning over time with recent arrivals has not been directly investigated.
Using the concepts of positive mental health and psychological distress separately may not only confirm and/or clarify prior research, but also have practical implications. From a public health perspective, a greater understanding of the distinction between mental health and psychological distress in association with language learning may aid in the design of language acquisition programs, as well as in creating effective and appropriate community-based mental health interventions for both the short term and the long term. The need for refugee support programs is not abating and in 2018 alone, the UNHCR resettled 102,800 refugees (UNHCR 2019).

Current Research

To examine resettled refugees’ psychological well-being and distress and their relationships with host country language learning, this research investigated initial levels of both psychological distress and positive mental health in relation to trajectories of English language acquisition over time among recently resettled refugees in the United States. In addition, the impact of initial levels of English proficiency on psychological distress and positive mental health over time were also explored. The similarities and differences between the two concepts of psychological distress and positive mental health were observed in conjunction with how they impact language learning to further explore the ways in which they represent two distinct constructs. In addition, refugees’ level of education, age, and gender were investigated as possible moderators of English acquisition over time.
Research Questions

I. Does initial English proficiency and/or trajectories of English language acquisition over time significantly vary by the initial psychological distress levels of recently resettled refugees?

   $H_{1a}$: Refugees with higher initial psychological distress will have significantly lower initial English proficiency.

   $H_{1b}$: Refugees with higher initial psychological distress will have a significantly slower rate of English language acquisition.

Reverse directionality: Does initial psychological distress level and/or trajectory of change in psychological distress over time significantly vary by the initial English speaking levels of recently resettled refugees?

   $H_{1c}$: Refugees with higher initial English proficiency will have significantly lower levels of initial psychological distress.

   $H_{1d}$: Refugees with higher initial English proficiency will have a significantly slower increase (or a decrease) in psychological distress.

II. Does initial English proficiency and/or trajectories of English language acquisition over time significantly vary by the initial positive mental health levels of recently resettled refugees?

   $H_{2a}$: Refugees with higher initial positive mental health will have significantly higher levels of initial English proficiency.

   $H_{2b}$: Refugees with higher initial positive mental health will have a significantly faster rate of English language acquisition.

Reverse directionality: Does initial positive mental health level and/or trajectory of change in positive mental health over time significantly vary by the initial English speaking levels of recently resettled refugees?

   $H_{2c}$: Refugees with higher initial English proficiency will have significantly higher levels of initial positive mental health.

   $H_{2d}$: Refugees with higher initial English proficiency will have significantly more rapid increases in positive mental health.

III. Are positive mental health and psychological distress independent, yet related, constructs?

   $H_{3a}$ The two measures will not be strongly correlated and will not be collinear.

   $H_{3b}$ The two measures will differ in their relationship to the outcome of English language acquisition.
IV. Is there significant variation in initial English proficiency and trajectories of English language acquisition of recently resettled refugees? If so, do any of the variables of education, age, or gender moderate these differences?

**H₄a:** Refugees with less previous education will have significantly lower initial English proficiency.

**H₄b:** Refugees with less previous education will have a significantly slower rate of English language acquisition.

**H₅a:** Older refugees will have significantly lower initial English proficiency.

**H₅b:** Older refugees will have a significantly slower rate of English language acquisition.

**H₆a:** Female refugees will have significantly lower initial English proficiency.

**H₆b:** Female refugees will have a significantly slower rate of English language acquisition.

**Methods**

This research used data from a randomized controlled trial of a community-based advocacy and learning intervention, the Refugee Well-being Project, conducted at the University of New Mexico from 2013 to 2017, which was funded by the National Institute on Minority Health and Health Disparities (R01MD007712) and approved by the University of New Mexico Human Research Protections Office.

**Refugee Well-being Project**

The Refugee Well-being Project (RWP) was designed to address resettlement stressors experienced by recently arrived refugees in the United States. The new arrivals are paired with university students who enroll in a two-semester class. During the fall semester of the class, undergraduate students learn about the regions from which the refugees originated, how to advocate for them, and the U.S. context of social inequities in education, housing, employment, health care, and other contributing factors to health disparities. At the end of the fall semester, the experiential learning portion of the class begins, and the students are matched with refugee families enrolled in the project. From November to May, refugee families
and students meet in weekly Learning Circles\textsuperscript{5}, during which the entire group of refugees and students sit together and, with the help of interpreters, discuss topics of mutual interest. In addition, the students and refugee families meet for three to five additional hours per week to work together on issues identified by the refugee or to socialize and learn about the others’ culture. Lessening the isolation and cultural barriers of newly arrived refugees and creating a space in which their experiences are valued and celebrated are fundamental underpinnings of the RWP.

**Study of RWP**

The RWP was first developed and implemented by Dr. Jessica Goodkind in 2000-2001 in Michigan, brought to New Mexico in 2006, and continues to be offered to newly resettled refugees in Albuquerque. During end-of-semester interviews, both the refugee and student participants consistently attest to the positive value of psychological support, practical helpfulness, and mutual learning of the RWP and to verify these findings, Dr. Goodkind implemented a randomized controlled trial (RCT) of the intervention\textsuperscript{6} with a grant from National Institutes of Health (NIH). Recruited in four annual cohorts (2013-2017), the refugee participants answered questions including measures of quality of life and psychological distress, as well as took a test to verify their gains in English proficiency over a period of a year.

\textsuperscript{5} Learning Circles are based in the philosophy that we are all teachers and learners. The dialogues are interpreted between multiple languages to facilitate complete engagement and include community-building themes like food and family but also topics such as safety, healthcare, and children’s education. The origin of Learning Circles is based on the practices of the Chicago Hull House founded by the sociologist Jane Addams in her efforts to create mutual learning environments for immigrants and the community in the early 1900s.

\textsuperscript{6} For more details about using a RCT design with a community-based project, see Goodkind et al. 2017. “Challenges and Innovations in a Community-Based Participatory Randomized Controlled Trial.”
Data Collection: Interview

Participants completed four interviews conducted over a period of 12 months: the first three interviews (pre, mid, and post) were three months apart and the last follow-up interview was six months after the end of the intervention. To participate, refugees must have arrived in the United States within the previous three years, be at least 18 years old, speak one of six languages (Arabic, Dari, Pashto, Swahili, Kinyarwanda, or French), and have originated from one of three geographic regions (Iraq or Syria, Afghanistan, or the Great Lakes region of Africa\(^7\)). The interview process and ethical considerations were explained to the participants in their native language as part of the consent process. The interviews were conducted in the participant’s home or a location of the participant’s choice in the language of their choosing. Rarely were interviews conducted over the phone and only when the participant had moved out of state after the initial interview.

A mixed methods approach was employed, with each participant completing an in-person qualitative interview, a computer-aided quantitative questionnaire, and an oral English test. The first portion, a semi-structured qualitative interview, was conducted by a native English speaker and was facilitated by an interpreter who also acted as a cultural broker. The second portion of the interview, the quantitative survey, was conducted by the interpreter alone in the respondent’s preferred language. After the initial demographic information and social network questions were answered, if the respondent was literate in their own language, the interpreter turned over the laptop computer for the respondent to answer the questions.

\(^7\) The Great Lakes Region of Africa includes the countries of Democratic Republic of Congo (DRC), Burundi, Rwanda, Uganda, and Tanzania.
privately, while remaining nearby to answer questions. The third portion, the English test, was administered by an English-speaking interviewer. The participants were thanked for their time and effort with a gift card of increasing value for each successive interview ($20, $30, $40, and $50).

Data
Quantitative Measures

Validated psychometric scales were used in the quantitative survey, and the measures were translated into five languages: Arabic, Dari, Pashtu, Swahili, and French, then independently back-translated to assure accuracy. All issues that arose with the translations were discussed, worked through, and agreed upon by the translators and the principal investigator of the study.

Positive Mental Health

In 1991, the World Health Organization began developing a comprehensive, culturally-sensitive instrument for the assessment of quality of life (World Health Organization Quality of Life measure; WHOQOL), which was defined as “the individuals’ perception of their position in life within the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards, and concerns” (Trompenaars et al. 2006; WHOQOL Group, 1994, 1998). The WHOQOL determines the subjective experience of the respondent while accounting for individual’s cultural background. Based on the original WHOQOL-100, the WHOQOL-BREF has 24 questions while still maintaining internal consistency (WHOQOL Group 1998). The RWP study’s interpreters/cultural brokers recommended omitting two items about body image/appearance and sexual activity because they deemed those questions as culturally unacceptable. The four domains
of the assessment are: 1) physical health, 2) psychological health, 3) social relationships, and 4) environment. In this study, the mental health measure was based on the psychological section with the three questions: How much do you enjoy your life? To what extent do you feel your life to be meaningful? How well are you able to concentrate? (in the last four weeks). These are related to the constructs of: 1) positive feelings, 2) spirituality/personal beliefs, and 3) thinking, learning, memory and concentration, and were self-rated on a scale of 1-5: Not at All (1), A Little (2), A Moderate Amount (3), Very Much (4), An Extreme Amount (5). This WHO Quality of Life measure was asked at each of the four interview time points.

Often mental health, psychological well-being, and quality of life are used interchangeably in the literature. Recent research has operationalized mental health using quality of life inventories (Payton 2009:215); therefore the use of the WHO Quality of Life measure to represent positive mental health is appropriate for this research.

**Psychological Distress**

The Hopkins Symptoms Checklist-25 (HSCL-25), developed in the mid-1970s, is a self-reported measure of Depression/Anxiety symptoms and has been used with refugee populations throughout the world (Derogatis, Lipman, Rickels, Uhlenhuth, and Covi 1974; Nickerson, Bryant, Silove, and Steel 2011; Sulaiman-Hill and Thompson 2010). It is now available in a number of languages and researchers have reported high internal consistencies (Cronbach's alpha) for the HSCL-25, with the results consistently over the 0.70 threshold and often in the 0.84 - 0.94 range for all three scales: anxiety, depression and the total score. The overall total score has been consistently highly correlated with severe emotional distress of an unspecified
diagnosis and the depression sub-score is correlated with major depression as
defined by the American Psychiatric Association in the Diagnostic and Statistical
Manual of Mental Disorders, IV Version (DSM-IV).

Response choices for each item are on a 4-point scale ranging from: ‘not at all’
to ‘extremely’. For this study, the multicultural research team decided one question
was too sensitive to ask newly arrived refugees, so Item 14 “Loss of sexual interest or
pleasure” was removed. See Appendix C for the 24 specific questions from the HSCL-
25. This self-reported measure of psychological distress was collected at each of the
four time points over the year.

**English Language Proficiency**

The variable of English Language Proficiency (scale of 1 to 7) is based on the
results from an English test (the Tacoma Community House ESL Testing Package)
administered by English speakers who were trained in groups to insure consistent
scoring. Each level of the test contains about 15-20 questions to which the refugee
participant was encouraged to respond in full sentences. If the participant achieved a
score of 75% or greater on that level, the next level was immediately administered.
For each interview time point, the highest level of the English test reached, but not
passed, was the recorded level. On subsequent interviews, the English test began at
the highest level attained during the previous interview; thus a refugee’s English
level was measured as either maintained or improved, but never decreased.

**Other Variables**

Other variables included in these analyses were: highest prior education level
reached, age at initial interview, and gender. Here they are not treated as fluid, and
only recorded at the first interview and thus are used as Level-2 variables. For the
descriptive statistics, the length of time in the United States (must be less than three years), trauma exposure (up to 27 separate events), region of origin (based on question about nationality), first language, literacy (in any language), marital status (single, married, divorced, widowed) were also reported. See Appendix B for the specific phrasing of the questions.

Multilevel Modeling

As a statistical framework designed for nested data, Multilevel Modeling (MLM) or Hierarchical Linear Modeling (HLM) allows for data grouped into larger units, and forgoes the assumption of independence between variables required of many statistical tests such as regression analyses (Anderson 2012; Raudenbush and Bryk 2002). Specifically for this longitudinal study, multilevel modeling accounts for multiple observations nested within individuals. Another essential advantage of multilevel modeling is flexibility in the data structure, such as allowing for missing data and unevenly spaced time intervals, which was needed as the final follow-up interview was conducted six months after the previous three interviews which were three months apart.

Formulas and Stata Commands for Multilevel Growth Models

In the formulas below, the growth models have time included as a Level-1 variable with a random slope. Also note in the Stata 14.2 commands below that the covariance structure was set as unstructured to allow correlation between the random slopes and intercepts. For Stata 14, the default for variance-covariance structure of the random effects is independent. The Stata 14 mle command is the option for maximum likelihood estimation (the default) and is necessary to compare models for fit.
Notation for the formulas: With growth models, Raudenbush and Bryk (2002) set up separate notation for growth models to create clarity when the formulas are combined in a three-level model. The Betas (β) represent coefficients at the person-level. Instead of ‘ij’ as the subscripts, the subscript of ‘ti’ is substituted in the growth models with ‘t’ representing time (Anderson 2012:27; Raudenbush and Bryk 2002).

**Model 1a** Unconditional Model with time allowed to randomly vary (used for comparison with subsequent models)

**Level 1 – Within Individual (time varying)**

$$\text{EngLevel}_{ti} = \pi_{0i} + \pi_{1i} \text{Time}_{ti} + e_{ti}$$

**Level 2 – Between Individuals (time invariant)**

$$\pi_{0i} = \beta_{00} + r_{0i}$$

$$\pi_{1i} = \beta_{10} + r_{1i}$$

Stata Command: `mixed englevel time ||id: time, var cov(unstr)`

Note: $\pi_{0i}$ is the intercept term, the average score of EngLevel at time0

$\pi_{1i}$ is the average monthly change in Englevel

**Model 1b** Quadratic Growth Model (unconditional)

**Level 1 – Within Individual (time varying)**

$$\text{EngLevel}_{ti} = \pi_{0i} + \pi_{1i} \text{Time}_{ti} + \pi_{2i} \text{Time}_{ti}##\text{Time}_{ti} + e_{ti}$$

**Level 2 – Between Individuals (time invariant)**

$$\pi_{0i} = \beta_{00} + r_{0i}$$

$$\pi_{1i} = \beta_{10} + r_{1i}$$

$$\pi_{2i} = \beta_{20}$$

Stata Command: `mixed englevel time##time ||id:time, var cov(un)`

**Model 2a**: Linear Growth Model with Level-2 variable with random slope of time

**Level 1 – Within Individual (time varying)**
\[ \text{EngLevel}_{i} = \pi_{0i} + \pi_{1i} \text{Time}_{i} + e_{ii} \]

**Level 2 – Between Individuals (time invariant)**

\[ \pi_{0i} = \beta_{00} + \beta_{10} \text{ (female)} + r_{0i} \]
\[ \pi_{1i} = \beta_{10} + r_{1i} \]

**Stata Command:** `mixed englevel female time||id:time, var cov(unstr)`

**Model 2b:** Growth model interaction of Level-2 variable with time

**Level 1 – Within Individual (time varying)**

\[ \text{EngLevel}_{i} = \pi_{0i} + \pi_{1i} \text{Time}_{i} + e_{ii} \]

**Level 2 – Between Individuals (time invariant)**

\[ \pi_{0i} = \beta_{00} + \beta_{10} \text{ (female)} + r_{0i} \]
\[ \pi_{1i} = \beta_{10} + \beta_{11} \text{ (female)} + r_{1i} \]

**Stata Command:** `mixed englevel female##time ||id:time, var cov(un) mle`

**Model 2c:** Quadratic growth model interaction of Level-2 variable with time

**Level 1 – Within Individual (time varying)**

\[ \text{EngLevel}_{i} = \pi_{0i} + \pi_{1i} \text{Time}_{i} + \pi_{2i} \text{Time}_{i}^2 + e_{ii} \]

**Level 2 – Between Individuals (time invariant)**

\[ \pi_{0i} = \beta_{00} + \beta_{10} \text{ (female)} + r_{0i} \]
\[ \pi_{1i} = \beta_{10} + \beta_{11} \text{ (female)} + r_{1i} \]
\[ \pi_{2i} = \beta_{20} + \beta_{12} \text{ (female)} \]

**Stata Command:** `mixed englevel female##time##time ||id:time, var cov(un) mle`

See Appendix E for the remaining formulas and syntax with variables of age, education, initial levels of psychological distress (PD), and initial levels of positive mental health (MH), as well as models with psychological distress and mental health as dependent variables.
The first models tested English language acquisition as the dependent variable, and then the reverse directionality was examined with English language acquisition as the independent variable. However, these were not exact reverse formulations, since for example, the initial levels of psychological distress were used to predict English language acquisition over time. Then the initial level of English language speaking was used to predict psychological distress over time. Similar tests were conducted with levels of positive mental health: first the initial level of positive mental health predicted English language acquisition and then the initial level of English language speaking predicted positive mental health over time.

The linear growth models were built starting from a base of the unconditional model (or the null model) with time, but no additional predictors. The Level-2 predictors, time invariant covariates (TIC) of education and age, were added and each of the resulting outcomes were compared with the previous model. Theoretical constructs balanced with parsimony were used to guide this incremental model building process. The interclass correlation coefficient (ICC) indicated the proportion of variance at Level-1 explained by the higher level grouping structure of Level-2, and helped determine whether additional variables were warranted (Anderson 2012; Raudenbush and Bryk 2002).

Growth curves are not always linear – in fact, a traditional ‘learning-curve’ is often represented with a steep initial slope and then decreasing growth – so a quadratic relationship over time was tested. The quadratic formula showed a
statistically significant relationship with a small coefficient, so was included in the results with the refugee characteristics of education level, age, and gender.

Analysis of Models and Variables

For this research, the following goodness-of-fit indices were used: ICC, AIC, and BIC. The intraclass correlation coefficient (ICC) describes how strongly the units at the same level resemble each other and therefore can be used to justify using hierarchical modeling. ICC ranges from 0 to 1 and a high ICC shows high similarity between values from the same level, whereas a low ICC close to zero indicates the values from the same level are not similar (and therefore multilevel modeling is unnecessary). However, additional dependence may arise with the addition of more predictor variables, so ICCs may not entirely justify abandoning multilevel modeling (Anderson 2012 [Roberts 2007]). Bayesian information criterion (BIC) is the probability of obtaining the current dataset, with the model being tested. The lowest BIC indicates the better model, but a difference of less than ten between models is considered negligible. For variables, the variance inflation factors (VIFs) and tolerances (1/VIF) quantify the severity of collinearity for ordinary least squares regression analysis and helps determine if the model is reliable.

Results

Descriptive Summary

The participants were relatively evenly divided by region of origin: 33% were from Iraq or Syria; 35% were from Afghanistan or the surrounding area; and 32% were from the Great Lakes region of Africa. The mean amount of time which participants had resided in the United States at the time they joined the study was 30
weeks (SD=28) – approximately 7.5 months. The mean age of the participants was 34.6 years (SD=11.52) with a range of 18 to 71 years, and 52.4% of the respondents were female. For marital status, the refugees were primarily married (58%), secondly, they were single (33%), then some widowed (7%) and a few divorced (2%). The prior trauma exposure reported by participants ranged from 0 to 27 on a scale of up to 27 traumatic experiences with the mean number of trauma experiences at 8.02 (SD=6.49). Eighty-four percent of the refugees reported being able to read. The top six languages they had learned first were: Arabic (30%), Dari (30%), Kirundi or Kinyarwanda (11%), Kiswahili (7%), Kibembe (6%), and Pashto (4%). For the remaining languages, fewer than ten refugees reported them as their first language.

The highest education level achieved at the time of enrollment in the study was a mean of 10.36 years (SD=5.42), with a range of 0-18. The education variable had a bimodal distribution with 10.5% of the respondents reporting that they had zero years of formal education, and at the other end: 18.7% graduated from High School, 9.4% had earned an Associate’s degree, 13.5% had a Bachelor’s degree, and 5% had a graduate or professional degree. (See Table 1A for the time invariant variables.)

In addition, to determine if this sample of refugees differed by gender on the variables of education, literacy, age, number of weeks in the U.S., and trauma exposure, a t-test was used. Only education and literacy were significantly different by gender. For males, the mean education level was 11.35 (S.D. = 4.81) and for females, the mean education level was nearly 2 levels lower at 9.43 (S.D. = 5.82), t(265)= 2.92, p= .0038. For literacy, 89.71% (S.D. = .31) of the males reported being
and 80.82% (S.D. = .40) of the females were literate in their primary language, \( t(280) = 2.10, p = .0364 \). To recap, the mean education level of male refugees was nearly two grade levels higher than females – 11\(^{th}\) grade vs. 9\(^{th}\) grade, and nearly 90% of the men were literate as compared to nearly 81% of the females.

<table>
<thead>
<tr>
<th>English Level at:</th>
<th>Mean</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Interview (time 0)</td>
<td>2.609</td>
<td>(.133)</td>
</tr>
<tr>
<td>Mid Interview (time 1)</td>
<td>3.206</td>
<td>(.145)</td>
</tr>
<tr>
<td>Post Interview (time 2)</td>
<td>3.491</td>
<td>(.149)</td>
</tr>
<tr>
<td>Follow-up Interview (time 3)</td>
<td>3.992</td>
<td>(.155)</td>
</tr>
</tbody>
</table>

![Figure 1](Figure1.png)

**Figure 1** Four histograms of English Levels by time points showing the transition from a greater percentage of refugees at level 1 to more at level 7 by the final interview.
The mean initial English speaking level was 2.6 (SD=2.22) on a scale from 1 to 7. Figure 1 shows the bimodal distribution of English scores from the administered test, and demonstrates the change in percentage of refugees who tested at English speaking level-1 during the 1st time point (pre-interview), dropping through the mid interview and post interview, until during final follow-up interviews, level 7 English speakers account for a greater percentage of the refugees than those testing at the lowest level of 1.

Two additional time-varying covariates were collected at each time point, positive mental health and psychological distress. Positive mental health, on a range of 3-15, had a mean of 10.25 (SD=2.75) at the initial starting point with higher scores representing healthier results. The Cronbach’s Alpha for this positive mental health scale ranged from .77 to .84 for the four time points, which is from acceptable to good; and the Cronbach’s Alpha for initial positive mental health with results at the first time point was .77, an acceptable internal consistency score. The mean of psychological distress at the initial time point was 1.51 (SD=0.58) on a 1 to 4-point scale with a higher score indicating more distress. The standard deviation of psychological distress was relatively narrow at 0.58; thus 95.4% of the refugees (those within 2 standard deviations) reported psychological distress scores of less than 2.67 on the 4-point scale. The Cronbach’s Alpha for this psychological distress scale ranged from .95 to .97 for the four time points, which are excellent internal consistencies; and for the initial psychological distress score solely, the Cronbach’s Alpha was .95, again an excellent score for internal consistency. (See Table 1B for the means of the time varying variables at each time point.)
Multilevel Growth Model Results

The refugees’ average initial English proficiency was significantly different from zero at 2.6 on a seven-point scale with a large and significant amount of variance, 2.2 standard deviations, which indicates that the starting levels of English speaking varied widely for the refugees. The growth in English fluency over time was statistically significant (0.1, p<.001), but the variance was not large, 0.1 standard deviations, indicating that, on average, refugees followed similar trajectories in gaining proficiency in speaking English over time. Specifically, refugee participants were predicted to increase their English test score by one level every ten months (p<.001) on the scale of 1 to 7. The intercept and slope were not statistically significantly related, so the initial level of language proficiency did not predict the future growth trajectory over time. The quadratic growth model of time on English Level was statistically significant with the quadratic coefficient of -.003 (p<.001), indicating a deceleration in growth. This may be due to a ceiling effect of the English test, exemplified by the fact that 33% of the refugees attained the maximum level of proficiency of level 7 by the final interview.

Psychological Distress (PD)

H1a: Refugees with higher initial psychological distress will have significantly lower initial English proficiency.
H1b: Refugees with higher initial psychological distress will have a significantly slower rate of English language acquisition.

Hypotheses 1a was supported, but hypothesis 1b was not supported – initial psychological distress levels were significantly related to initial English Language levels, but not to the trajectory of growth in learning to speak English.

The higher the initial level of psychological distress reported by refugee respondents, the lower they tested in their English language level. Specifically, for
every unit higher in psychological distress at the initial time point, the English level was predicted to be over half of a level lower (-.542, p<.05) on 1 to 7 scale. However, initial psychological distress was not shown to moderate the growth trajectory of learning English (see Table 2).

Mental Health (MH)

**H2a:** Refugees with higher initial positive mental health will have significantly higher initial English proficiency.

**H2b:** Refugees with higher initial positive mental health will have a significantly faster rate of English language acquisition.

Hypothesis 2a was nearly supported and hypothesis 2b was not supported – initial positive mental health levels were nearly significantly related to initial English Language levels, and initial positive mental health was not related to the trajectory of growth in learning to speak English.

The initial level of reported positive mental health was nearing significance in its relationship with predicted English language level. For every unit higher of mental health at the initial time point, the English language level was predicted to be .094 higher (nearing significance p = .053). However, initial mental health was not shown to moderate the growth trajectory for respondents’ English speaking (see Table 3).

Psychological Distress (PD) as the dependent variable (with initial English Level as IV)

**H1c:** Refugees with higher initial English proficiency will have significantly lower levels of initial psychological distress.

**H1d:** Refugees with higher initial English proficiency will have a significantly slower increase (or a decrease) in psychological distress.

Hypotheses 1c was supported, but hypothesis 1d was not supported – initial English Language levels were significantly related to initial psychological distress levels, but not to the trajectory of change in psychological distress.

Generally, refugees’ psychological distress (PD) decreased over time: in the unconditional model with PD as the dependent variable, for each month, their
psychological distress decreased .012 (p<.001) on a scale of 1 to 4. The variance of
the linear component was statistically significant, though less than .001, indicating
that the change over time had significant variance among refugee participants – in
other words, that all refugees did not follow a consistent trajectory of decreased
psychological distress over time. The mean initial level of PD was 1.52 (p<.001) with
a variance of 0.5 standard deviations (or 0.27 units on the 1 to 4 scale). See Table 4 –
column 1.

In the model with initial English level interacting with time, refugees with
higher initial English proficiency had lower initial levels of psychological distress (-
.42, p<.01), but initial English proficiency was not found to be a significant
moderator of changes in psychological distress over time. See Table 4 – column 3.

Mental Health (MH) as the dependent variable (with initial English Level as IV)

H2c: Refugees with higher initial English proficiency will have significantly higher
levels of initial positive mental health.

H2d: Refugees with higher initial English proficiency will have significantly more
rapid increases in positive mental health.

Both hypotheses 2c and 2d were supported – initial English Language levels were significantly related
to initial mental health levels, as well as to the trajectory of change in mental health.

In the unconditional model with mental health as the dependent variable, the
mean initial level of mental health was 10.28 (range 3-15). The variance of the
intercept was significant, indicating that participants had significantly different
levels of initial positive mental health. The linear change component was also
statistically significant, indicating a trajectory of increased mental health over time.
The quadratic effect was tested but was not statistically significant, indicating that
the trajectory of change more closely fit a linear pattern. For every additional month,
positive mental health increased by .03 (p<.05); in other words, over the course of a year, refugees’ mental health levels were projected to increase by .36 or about one-third of a unit on a 12-point scale. The variance of the linear change component was significant, indicating that the slope of change varied between the respondents (in other words, participants were not following a similar trajectory of increased mental health over time).

When adding initial level of English proficiency as a moderator to the model, it was a statistically significant moderator of initial mental health and of the linear change over time in positive mental health. The interaction between initial English level and time was .011 (p<.05), indicating that the rate of change in mental health was .011 per month higher with each level higher that the refugees initially tested in their English speaking. Thus, the participants with higher levels of English proficiency at the outset had a significantly steeper increase in their positive mental health over time, beyond the increase of .16 (p<.05) per month on a range of 3 to 15. The trajectory of growth in mental health for those with lower initial English proficiency improved less over time, but they still experienced improvement in their mental health (see Table 5).
In Figure 2, the graph demonstrates the influence of initial English levels on mental health, indicating support of the hypothesis that host-country language acquisition is a protective factor during refugees’ resettlement.

Figure 2 Predicted positive mental health growth trajectories by initial levels of English proficiency.

Positive Mental Health compared to Psychological Distress

Are positive mental health and psychological distress independent, yet related?

H3a The two measures will not be strongly correlated, and will not be collinear.
H3b The two measures differ in their relationship to the outcome of English language acquisition.

Hypothesis 3a was supported – positive mental health and psychological distress are correlated but not strongly. Additionally, they do not appear to be collinear. Hypothesis 3b was more difficult to clearly support. For both measures, the initial levels were not statistically significant in their association with English language learning over time. However, with a reversal in directionality, initial English language level was significantly associated with the trajectory of positive mental health, but not with changes over time for psychological distress.
The relationship at the initial time point between psychological distress and positive mental health was a negative correlation, -0.5574 (p<.001), which is a moderate, but not a strong inverse relationship (Hinkle, Wiersma, and Jurs 2003). This is consistent with the theory that they are related but not on the same continuum. The two variables do not appear to be collinear: the VIF (Variance Inflation Factor) for the variables is 1.48 which does not exceed 10, the accepted norm for collinearity. Since collinearity is a matter of degree, there is no irrefutable test, but only warning signs. If the two variables of psychological distress and positive mental health had a high degree of collinearity, we might assume that they were measuring the same latent concept. Instead, the minor indicators of collinearity seem fitting with the theory that psychological distress and positive mental health are not the opposite poles of a single continuum, but rather related concepts on two separate continuums. This is not a definitive conclusion, but merely a suggestion of the relationship with more research required.

In contrast to the lack of statistical significance with psychological distress, there was a significant relationship between the initial English level and the change of positive mental health over time (see Table 5). These differences in PD and MH in relation to English proficiency appear to attest to differing constructs underlying the two (as opposed to the same construct, just polar opposites).

Education

**H4a:** Refugees with less previous education will have significantly lower initial English proficiency.

**H4b:** Refugees with less previous education will have a significantly slower rate of English language acquisition.
Both hypotheses 4a and 4b were supported – higher levels of prior Education predicted higher levels of initial English speaking level and also were shown to moderate increased rates of growth in English acquisition.

Refugees who attained higher levels of formal education prior to arriving in the United States began at higher English language levels on average. For every unit higher in education prior to arrival (on a range from 0 to 18), their English level was predicted to be .198 higher (p<.001) on a seven-point scale. Therefore, the difference between those without formal education and those with the mean education level of 10th grade was predicted to be about two levels. Essentially, those without prior education tested at the lowest level of 1 on the English test and on average, those with the mean level of education were predicted to speak nearing a level 3 on the 1 to 7 level scale during the first interview. Those with the highest level of education were predicted to be another 1.5 levels higher at the initial time point – above a level 4 on the English test ranging from 1 to 7.

Education also was shown to moderate the growth of English learning – specifically, the growth in English speaking was .011 (p<.001) per month faster with each 1 unit increase in initial level of education. Thus, respondents with the average level of education (10th grade) had an additional increase of 0.11 per month as compared to those without any formal education. Those with the most education (at the top of the scale with an 18) had an increased rate by .198 per year above the average rate of growth in speaking English of those without formal education. In fact, this more rapid rate of gaining English proficiency over time indicated that the
most educated refugees would gain approximately two levels more on average during the course of a year than those with no formal education (see Table 6a – column 1).

In Figure 3, the differences in initial starting point and trajectory of growth in English language learning are very clear. For the highest level of education which is beyond a bachelor’s degree, such as graduate school, the refugees’ average initial English speaking level is predicted to be approximately 4.50 and increase at a rate of nearly 2 levels within the year. In contrast, those with no formal education are predicted to have an initial level below the scale at .6 and increase half a level over ten months. The ten-year difference in education to the mean level of 10th grade increases the predicted initial English speaking to nearly a level of 3 with an average
rate of growth of about one level every ten months. Thus, education appears to be the strongest predictor not only of initial speaking level but also of the growth trajectory for English speaking.

**Age**

$H_{5a}$: Older refugees will have significantly lower initial English proficiency.

$H_{5b}$: Older refugees will have a significantly slower rate of English language acquisition.

Both hypotheses $5a$ and $5b$ were supported – refugees with greater age initially tested at lower levels in English speaking and also were shown to have slower rates of growth in English acquisition.

The projected mean initial level of English proficiency was 2.604 ($p<.001$) for the person of average age which was 34.6 for this group of refugees. Refugees who were older had lower initial mean values of English speaking level. For every additional year of age, their initial English speaking level was predicted to be 0.032 lower ($p<.01$) on a 1-7 scale. In other words, for each decade greater in age, the initial English language level predicted for recently resettled refugees was a third of a level lower on a seven-point scale ($p<.01$).

Age was also a significant moderator of the growth trajectory of English language acquisition. With each additional year of age, improvement in English speaking was .002 ($p<.05$) less per month. In other words, with each additional decade of age, the positive trajectory of English language learning decreased by .024 per month (see Table 6a – column 2).
In Figure 4, the statistically significant results of younger refugees having a higher initial English speaking level are shown with the initial English levels ranging from a predicted level of 2 for older refugees and a predicted level of 3 for the younger ones. Then, the statistically significant faster rate of learning English is demonstrated with the widening dispersion of the predicted English speaking trajectory by the final time point: initially the refugees were within about 1 level of one another and a year later they are predicted to be 2 levels apart. However, in general, at all ages, refugees’ English speaking abilities are predicted to increase over time.

Gender

H₆ₐ: Female refugees will have significantly lower initial English proficiency.
H₆ₘ: Female refugees will have a significantly slower rate of English language acquisition.
Hypothesis 6a was supported, however hypothesis 6b was not – female refugees tested lower in their initial English speaking than male refugees, but did not differ from their male counterparts in their rate of acquiring English speaking.

At the initial interview, female refugees had lower mean values by one level (p<.001) of speaking English as compared to their male counterparts. The average initial level of English speaking for males was 3.135 (p<.001) and the average initial level for females was 2.123 (p<.001) on a 1 to 7 range. However, gender was not a significant moderator of English language acquisition over time as shown by the lack of statistical significance in the interaction between gender and time on English level (see Table 6a – column 3).

In Figure 5, the full level difference in the predicted initial English speaking between male and female refugees is clearly shown as well as the lack of difference in the predicted trajectory of their learning curve. Part of the initial difference in

![Quadratic Growth Model](image)

Figure 5 Predicted gender differences in English speaking initially, but parallel slopes of growth.
English speaking between the genders may be attributed to the two-level gap in education; although this initial educational gap does not moderate the learning trajectory of the females – in fact, they were predicted to learn English on the same trajectory as their male counterparts. This finding may imply that the female refugees are receiving and taking advantage of opportunities to learn English, interact with the community, attain employment, and are being supported in their additional responsibilities at this time, in this particular region.

**Model combining education and age**

The best model for predicting refugee English proficiency included both education level and age as moderators of change over time (see table 6b, column 2). The intercept (average initial level of English proficiency) was predicted to be 2.72 (p<.001), which was significantly different from 0, meaning that the refugee participant with the average age of 34 and average education level of 10th grade were predicted to be nearing a level 3 in speaking English initially. However, there was a large amount of variance in the intercept (3.59, S.E. = .33), signifying that refugees were widely dispersed in their initial level of speaking English. Again, the rate of change over time was .10 (p<.001), which indicated that on average refugees gained one level in speaking English every ten months. The variance in the change over time was statistically significant (.008, S.E. = .001) implying that refugees followed different growth trajectories in their English learning. The coefficient for education interacting with time was .005 (p<.001), meaning that for every additional unit of education per month, English language level was predicted to rise by an additional .005. This can also be stated as, for each ten-month period, those with an additional
ten units in education, their English language speaking rose by another half a level on the 1 to 7 scale. The coefficient of age over time was -.002 (p<.001) which suggests that for every additional decade of age, the English language level growth was .02 less per month. Generally, those with more initial education and who were younger were predicted to significantly increase their English speaking at a faster rate.

Discussion

Overall, these findings suggest that English language ability is a protective factor for the mental health of refugees, and that psychological distress does not appear to thwart the language learning process over a year time period. Similar to the findings with previous waves of refugees from Indochina in the 1970s and 1980s, the characteristics of education and age are relevant to initial host country language level, and to the trajectory of language learning over time (Beiser and Hou 2001); however, there appears to be a change within the category of gender. Although refugee women initially have a lower level of English proficiency, they are not significantly different from their male counterparts in the trajectory of growth in acquiring English over a year. This may reflect expanded learning opportunities for refugee women in the United States and/or increased exposure to English through a change in the expectations of refugee families for work outside the home and the support staff of refugee resettlement agencies encouraging and finding employment for all refugee adults.

Prior researchers have posited that refugees’ host country language proficiency is a protective factor for mental health, and thus supports the theoretical construct of the social determinants of health and mental health. With increased
communication skills, refugees gain access to society’s knowledge base, and then have greater access to employment and more skilled positions, and greater understanding of the complex bureaucracies they need to navigate for healthcare and their children’s education. A lack of access to power and resources which drive the social determinants of health have been shown to contribute to health inequities among socially and economically disadvantaged groups (Marmot 2005; Thoits 2010).

In contrast to cross-sectional results, the multilevel growth models did not show that initial levels of psychological distress inhibited the acquisition of English speaking ability over time; although in qualitative studies, refugees have reported psychological distress creating a barrier to learning (Salvo and de C Williams 2017; Sulaiman-Hill and Thompson 2012). This finding may accurately describe the lack of impact psychological distress has on English language acquisition over time among refugees in the United States; it could also be that these findings are due to the use of only the initial level of psychological distress in the analyses or to the particular measure of psychological distress used in this study. For example, it might be that depression and anxiety symptoms have less of an impact on learning than post-traumatic stress disorder (PTSD) symptoms. Perhaps further distinguishing psychological disorder from daily and acculturative stressors might yield results that are more consistent with qualitative findings from other studies. In Payton’s (2009) research, he used a structural equation model (SEM) to differentiate between psychological distress and disorder, as well as positive mental health. Using this
model to distinguish between distress and disorder, future research may further
disentangle the effects on acquisition of the host country language.

It is also important to note that some of the prior research on refugee
psychological distress and its relationship to English proficiency was cross-sectional
in addition to only investigating psychological distress in relation to language
acquisition. Beiser and Hou (2001) noted that various studies yielded conflicting
results with some research indicating a relationship between lack of language fluency
and symptoms of psychological distress and other studies showing no connections
(Beiser and Hyman 1997; Chung and Kagawa-Singer 1993; Nwadiora and McAdoo
1996; Rumbaut 1989). The feelings of lack of progress in learning English may be
intense at a concentrated time and induce frustration especially with the transitional
stressors being confronted, and then with more exposure to English and time to
process the new knowledge, refugees may find the blockages to learning and
psychological distress dissipate as they master their new environment.

Although this current research indicates that over time, refugee’s initial
psychological distress is not predictive of their language learning trajectory within
the first three years of arrival, at the end of the year, 27% of the refugees were still
testing at a level 1 in English speaking. Approximately half of those who initially were
demonstrating English speaking level of 1 were able to progress, but 27% is still a
sizable portion of the sample. With previous waves of refugees from Indochina,
Beiser and Hou (2001) found that after ten years in Canada 8% of the refugees spoke
no English. In another study of immigrants’ language acquisition in the receiving
country, on average 8.5% of all immigrants in the United States were unable to speak
English (Jasso, Massey, Rosenzweig, and Smith 2000). A further deconstruction of the barriers for refugees who are not learning the host country language is necessary to ascertain whether it impacts their positive mental health, future outlook, and feelings of security. Perhaps a portion of refugees still testing at a level 1 after one year are content within their families and community; however, may later be interested in learning the host country language. Another portion of those not acquiring English language skills may be overwhelmed and resigned, indicating a need to meet their learning requirements with different methods and/or at a later time when they have acclimated to the vast changes and demands on their time and energies. A future direction of this research may be in terms of delving into the differences between those who were able to progress to the next levels of English speaking and those who remained non-proficient in the host country language – whether it be by characteristics such as education level, literacy, age, gender, employment or by psychological status.

Consistent with prior research findings (Beiser and Hou 2001), certain characteristics of refugees, namely education level and age, were significant moderators of English language proficiency and acquisition. Not surprisingly, education appears to be the strongest predictor not only of initial speaking level but also to the trajectory of growth in English speaking. This may be a direct result of more educated refugees being comfortable in a formal classroom environment, having already mastered learning skills and having experienced past success in acquiring new knowledge. Again, consistent with previous study results, younger refugees started with a higher initial English speaking level and experienced a faster
rate of learning English which may be related to more time in class, on the job, and their expectations of future need for language skills to succeed in the new country. The finding of a full level difference in initial English speaking between male and female refugees was in keeping with prior research; however the lack of difference in their learning trajectory was a new finding. This result will need to be replicated in other locations in the United States and other countries of resettlement. It may be the result of a change in the expectations of and/or opportunities available to women for their role in their families and society or additional supports for childcare and child-friendly workspaces or encouragements offered by resettlement agency staff. Many of the female refugees in the study expressed the desire for educational opportunities – whether they were from a traditional, conservative family or not. This indicated that they were not necessarily interested in shedding their cultural values, but were interested in becoming more educated and recognized mastering English as important to achieving their goals.

The differences found in this research between the relationships of psychological distress and positive mental health with English language acquisition appear to support the theory that the two are distinct constructs. Their moderate negative correlation and small indicators of collinearity fit with the concept that they are related but not on the same continuum. In future research with refugees, a focus on the measures used for positive mental health and for psychological distress, and distinguishing between them, may be instrumental in untangling conflicting findings. In addition, longitudinal studies will be critical in determining the pathways and stages of language learning, establishment of stable mental health, and
treatment for depression and PTSD. As Beiser and Hou (2001) summarized, the transformational stages in adjusting to a host country are not linear, even progressions – refugees may focus on short-term goals and overcoming prescient challenges in the first several years, leaving the prior traumatic experiences to be addressed at a later time.

Another factor often debated is that the measures used to gauge psychological distress and positive mental health are often confounded by validity and reliability issues between different cultural groups. Researchers such as Chung and Kagawa-Singer (1993), Vega and Rumbaut (1991) and Schnittker (2017) have pointed out that mental health studies have been clinically based and biased toward a disease model to the exclusion of social and cultural factors. This will continue to be an important area for future research, and a productive one in understanding concepts such as psychological distress, as opposed to psychological disorder, and the intertwining aspects of culture informing the understandings and presented symptoms. Cross-cultural research will continue to be key to unearthing these distinctions.

Conclusion

The escalating number of people worldwide being forced to relocate, especially war-displaced refugees, has wide-ranging implications for cultural transformations and health outcomes. When refugees resettle in a new society, their successful integration contributes to their long-term well-being and host country language acquisition is an important component to their adjustment. This research confirms the widely held theory that host-country language acquisition acts as a protective factor for refugees in transition. The findings concerning new arrivals with
less education and who are older reinforce the importance of providing additional support for them as they become comfortable speaking English. These subgroups of refugees typically learn the new language over time, just at a slower rate. They need English learning environments which give them the time to adjust to new learning requirements and to gain new skills while also allowing them to fulfil other demands in transitioning to a new culture. It was interesting to note that although refugee women had a lower mean level of initial English proficiency, they did not differ from their male compatriots in the rate of learning English. This may indicate that the support programs in place are successful in assisting this current wave of refugee women. Overall, these results confirm that in general, refugees demonstrate resilience in the resettlement process by their progress in learning the host-country language; however, those who may be more marginalized may continue to struggle in learning English and need additional assistance, in order to support their positive mental health.

The importance of distinguishing positive mental health and psychological distress as separate measures was reinforced with this longitudinal study. These findings support the importance of strength-based approaches, which value the capacity of individuals and their communities and build on those potentials, and reinforce positive mental health; rather than problem-focused perspectives that highlight the psychological distress of refugees without fully recognizing their resilience.
Table 1a Descriptive Statistics – Time Invariant Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Proportion</th>
<th>Median</th>
<th>Mean</th>
<th>Std Dev</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education Level (0-18)</td>
<td></td>
<td>13</td>
<td>10.36</td>
<td>5.42</td>
<td>267</td>
</tr>
<tr>
<td>Literacy (0=no; 1=yes)</td>
<td>84.2</td>
<td></td>
<td></td>
<td></td>
<td>285</td>
</tr>
<tr>
<td>Age (18 to 71)</td>
<td></td>
<td>34</td>
<td>34.60</td>
<td>11.52</td>
<td>290</td>
</tr>
<tr>
<td>Weeks in the U.S. (1-166)</td>
<td>19.71</td>
<td>29.91</td>
<td>27.97</td>
<td></td>
<td>290</td>
</tr>
<tr>
<td>Trauma Exposure (0-27)</td>
<td>7</td>
<td>8.02</td>
<td>6.49</td>
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<td>286</td>
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<tr>
<td>Female (0 = Male; 1 = Female)</td>
<td>52.4</td>
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<td></td>
<td></td>
<td>290</td>
</tr>
<tr>
<td>Marital Status:</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>33.1</td>
<td></td>
<td></td>
<td></td>
<td>96</td>
</tr>
<tr>
<td>Married</td>
<td>58.3</td>
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<td></td>
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<td>169</td>
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<tr>
<td>Divorced</td>
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<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Widowed</td>
<td>6.6</td>
<td></td>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Region of Origin:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iraq/Syria</td>
<td>32.8</td>
<td></td>
<td></td>
<td></td>
<td>95</td>
</tr>
<tr>
<td>Afghanistan/Tajikistan/Iran</td>
<td>35.5</td>
<td></td>
<td></td>
<td></td>
<td>103</td>
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<tr>
<td>Great Lakes Region of Africa</td>
<td>31.7</td>
<td></td>
<td></td>
<td></td>
<td>92</td>
</tr>
<tr>
<td>First Language (Top 6):</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Arabic</td>
<td>30.3</td>
<td></td>
<td></td>
<td></td>
<td>88</td>
</tr>
<tr>
<td>Dari/Farsi</td>
<td>29.7</td>
<td></td>
<td></td>
<td></td>
<td>86</td>
</tr>
<tr>
<td>Kirundi/Kinyarwanda</td>
<td>11.0</td>
<td></td>
<td></td>
<td></td>
<td>32</td>
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<tr>
<td>Kiswahili</td>
<td>6.6</td>
<td></td>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Kibembe</td>
<td>6.2</td>
<td></td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Pashto</td>
<td>3.8</td>
<td></td>
<td></td>
<td></td>
<td>11</td>
</tr>
</tbody>
</table>

N = 290
Obs w/ 4 time pts = 1,160

Source: Refugee Well-being Project (RWP) of the University of New Mexico (2013-17)
### Table 1b Descriptive Statistics – Time Varying Variables

<table>
<thead>
<tr>
<th></th>
<th>Time 0 (Pre)</th>
<th>Time 1 (Mid)</th>
<th>Time 2 (Post)</th>
<th>Time 3 (Follow-up)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std Dev</td>
<td>Obs</td>
<td>Mean</td>
</tr>
<tr>
<td>English Language Level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1-7 scale)</td>
<td>2.57</td>
<td>2.20</td>
<td>278</td>
<td>3.20</td>
</tr>
<tr>
<td>Positive Mental Health</td>
<td>10.25</td>
<td>2.75</td>
<td>275</td>
<td>10.45</td>
</tr>
<tr>
<td>(3-15 scale)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological Distress</td>
<td>1.51</td>
<td>0.58</td>
<td>273</td>
<td>1.49</td>
</tr>
<tr>
<td>(1-4 scale)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N = 290</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Refugee Well-being Project (RWP) of the University of New Mexico (2013-17)
Table 2 Linear Growth Models English Acquisition moderated by Initial Psychological Distress

<table>
<thead>
<tr>
<th></th>
<th>Null with time</th>
<th>Std Err</th>
<th>+ Initial PD</th>
<th>Std Err</th>
<th>+ Initial PD interact w/time</th>
<th>Std Err</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average (fixed) effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept—initial level ($\beta_{00}$)</td>
<td>2.660 *** (.133)</td>
<td></td>
<td>3.502 *** (.365)</td>
<td></td>
<td>3.478 *** (.370)</td>
<td></td>
</tr>
<tr>
<td>Linear change ($\beta_{10}$)</td>
<td>.102 *** (.007)</td>
<td></td>
<td>.102 *** (.007)</td>
<td></td>
<td>.110 *** (.020)</td>
<td></td>
</tr>
<tr>
<td>Initial Psychological Distress</td>
<td></td>
<td></td>
<td>-.558 * (.226)</td>
<td></td>
<td>-.542 * (.229)</td>
<td></td>
</tr>
<tr>
<td>Initial PD effect - interaction ($\beta_{11}$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.005 (.012)</td>
<td></td>
</tr>
<tr>
<td><strong>Random variance estimates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept variance ($\tau_{00}$)</td>
<td>4.835 (.421)</td>
<td></td>
<td>4.739 (.413)</td>
<td></td>
<td>4.739 (.413)</td>
<td></td>
</tr>
<tr>
<td>Linear change variance ($\tau_{10}$)</td>
<td>.010 (.001)</td>
<td></td>
<td>.010 (.001)</td>
<td></td>
<td>.010 (.001)</td>
<td></td>
</tr>
<tr>
<td>Cov of S with I</td>
<td>-.021 (.016)</td>
<td></td>
<td>-.022 (.016)</td>
<td></td>
<td>-.022 (.016)</td>
<td></td>
</tr>
<tr>
<td>Var(Residual)</td>
<td>.296 (.019)</td>
<td></td>
<td>.296 (.019)</td>
<td></td>
<td>.295 (.019)</td>
<td></td>
</tr>
<tr>
<td>Participants N = 290</td>
<td>287</td>
<td></td>
<td>287</td>
<td></td>
<td>287</td>
<td></td>
</tr>
<tr>
<td>Observations = 1,160</td>
<td>1,062</td>
<td></td>
<td>1,062</td>
<td></td>
<td>1,062</td>
<td></td>
</tr>
<tr>
<td>ICC</td>
<td>.942 (.006)</td>
<td></td>
<td>.941 (.006)</td>
<td></td>
<td>.941 (.006)</td>
<td></td>
</tr>
<tr>
<td>AIC</td>
<td>3277.375</td>
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<td>3273.35</td>
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</tr>
<tr>
<td>BIC</td>
<td>3307.182</td>
<td></td>
<td>3308.126</td>
<td></td>
<td>3314.921</td>
<td></td>
</tr>
</tbody>
</table>

Source: Refugee Well-being Project (RWP) of the University of New Mexico (2013-17)

Key: coefficient (standard error)
+ p<.1, * p<.05, ** p<.01, *** p<.001

NOTE: for Var and Cov, if 95% C.I. crosses zero, then not significant and indicated above by light grey text.
Table 3 Linear Growth Models: English Acquisition moderated by Initial Mental Health

<table>
<thead>
<tr>
<th>English Acquisition (DV)</th>
<th>Null with time</th>
<th>Std Err</th>
<th>+ Initial MH</th>
<th>Std Err</th>
<th>+ Initial MH interact w/time</th>
<th>Std Err</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average (fixed) effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept—initial level ($\beta_{00}$)</td>
<td>2.660 *** (.133)</td>
<td>1.707 *** (.509)</td>
<td>1.700 *** (.515)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear change ($\beta_{10}$)</td>
<td>.102 *** (.007)</td>
<td>.102 *** (.007)</td>
<td>.105 *** (.027)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial Mental Health</td>
<td></td>
<td>.094 + (.048)</td>
<td>.094 + (.049)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial MH effect - interaction ($\beta_{11}$)</td>
<td></td>
<td></td>
<td>-.000 (.003)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Random variance estimates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept variance ($\tau_{00}$)</td>
<td>4.835 (.421)</td>
<td>4.778 (.417)</td>
<td>4.778 (.417)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear change variance ($\tau_{10}$)</td>
<td>.010 (.001)</td>
<td>.010 (.001)</td>
<td>.010 (.001)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cov of S with I</td>
<td>-.021 (.016)</td>
<td>-.022 (.016)</td>
<td>-.022 (.016)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Var(Residual)</td>
<td>.296 (.019)</td>
<td>.296 (.019)</td>
<td>.296 (.019)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participants N = 290</td>
<td>287</td>
<td>286</td>
<td>286</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations = 1,160</td>
<td>1,062</td>
<td>1,059</td>
<td>1,059</td>
<td></td>
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<td></td>
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<tr>
<td>ICC</td>
<td>.942 (.006)</td>
<td>.942 (.006)</td>
<td>.942 (.006)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIC</td>
<td>3277.375</td>
<td>3266.815</td>
<td>3268.806</td>
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<tr>
<td>BIC</td>
<td>3307.182</td>
<td>3301.517</td>
<td>3308.527</td>
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</tr>
</tbody>
</table>

Source: Refugee Well-being Project (RWP) of the University of New Mexico (2013-17)

+ p<.1, * p<.05, ** p<.01, *** p<.001

Key: coefficient (standard error)

NOTE: for Var and Cov, if 95% C.I. crosses zero, then not significant and indicated above by light grey text.
Table 4 Linear Growth Models: Psychological Distress moderated by Initial English Proficiency

<table>
<thead>
<tr>
<th>Psychological Distress (DV)</th>
<th>Null with time</th>
<th>Std Err</th>
<th>+ Initial English</th>
<th>Std Err</th>
<th>+ Initial English interact w/time</th>
<th>Std Err</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average (fixed) effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept—initial level (β_{00})</td>
<td>1.520 *** (.034)</td>
<td></td>
<td>1.638 *** (.047)</td>
<td></td>
<td>1.634 *** (.052)</td>
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<tr>
<td>Linear change (β_{10})</td>
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<td></td>
<td>-.012 *** (.002)</td>
<td></td>
<td>-.011 *** (.003)</td>
<td></td>
</tr>
<tr>
<td>Initial English level</td>
<td>-0.438 *** (.013)</td>
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<td></td>
<td></td>
<td>-0.424 ** (.015)</td>
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</tr>
<tr>
<td>Initial English effect - interaction (β_{11})</td>
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<td></td>
<td></td>
<td></td>
<td>-.000 (.000)</td>
<td></td>
</tr>
<tr>
<td><strong>Random variance estimates</strong></td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td>Intercept variance (τ_{00})</td>
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<td>.260 (.027)</td>
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<td>.260 (.027)</td>
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<tr>
<td>Linear change variance (τ_{10})</td>
<td>.000 (.000)</td>
<td></td>
<td>.000 (.000)</td>
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<td>.000 (.000)</td>
<td></td>
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<tr>
<td>Cov of S with I</td>
<td>-.006 (.001)</td>
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<td>-.006 (.001)</td>
<td></td>
<td>-.006 (.001)</td>
<td></td>
</tr>
<tr>
<td>Var(Residual)</td>
<td>.086 (.005)</td>
<td></td>
<td>.087 (.005)</td>
<td></td>
<td>.087 (.005)</td>
<td></td>
</tr>
<tr>
<td>Participants N = 290</td>
<td>290</td>
<td></td>
<td>287</td>
<td></td>
<td>287</td>
<td></td>
</tr>
<tr>
<td>Observations = 1,160</td>
<td>1,110</td>
<td></td>
<td>1,099</td>
<td></td>
<td>1,099</td>
<td></td>
</tr>
<tr>
<td>ICC</td>
<td>.757 (.023)</td>
<td></td>
<td>.751 (.024)</td>
<td></td>
<td>.751 (.024)</td>
<td></td>
</tr>
<tr>
<td>AIC</td>
<td>1,193.403</td>
<td></td>
<td>1,179.817</td>
<td></td>
<td>1,181.791</td>
<td></td>
</tr>
<tr>
<td>BIC</td>
<td>1,223.476</td>
<td></td>
<td>1,214.832</td>
<td></td>
<td>1,221.809</td>
<td></td>
</tr>
</tbody>
</table>

Source: Refugee Well-being Project (RWP) of the University of New Mexico (2013-17)

+ p<.1, * p<.05, ** p<.01, *** p<.001

Key: coefficient (standard error)

NOTE: for Var and Cov, if 95% C.I. crosses zero, then not significant and indicated by light grey text.
Table 5 Linear Growth Models: Positive Mental Health moderated by Initial English Level

<table>
<thead>
<tr>
<th>Mental Health (DV)</th>
<th>Null with time</th>
<th>Std Err</th>
<th>+ Initial English</th>
<th>Std Err</th>
<th>+ Initial English interact w/time</th>
<th>Std Err</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average (fixed) effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept—initial level ($\beta_{00}$)</td>
<td>10.284 *** (.155)</td>
<td>9.642 *** (.216)</td>
<td>9.843 *** (.239)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear change ($\beta_{10}$)</td>
<td>.030 * (.012)</td>
<td>0.032 ** (.012)</td>
<td>0.004 (.019)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial English level</td>
<td>0.238 *** (.058)</td>
<td>0.161 * (.070)</td>
<td>.011 * (.005)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial English effect - interaction ($\beta_{11}$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Random variance estimates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept variance ($\tau_{00}$)</td>
<td>4.604 (.590)</td>
<td>4.479 (.563)</td>
<td>4.475 (.559)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear change variance ($\tau_{10}$)</td>
<td>.001 (.004)</td>
<td>.0007 (.0007)</td>
<td>.001 (.001)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cov of S with I</td>
<td>-0.045 (.038)</td>
<td>-0.055 (.031)</td>
<td>-0.055 (.031)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Var(Residual)</td>
<td>3.590 (.215)</td>
<td>3.587 (.178)</td>
<td>3.570 (.177)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participants N = 290</td>
<td>290</td>
<td>287</td>
<td>287</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations = 1,160</td>
<td>1,111</td>
<td>1,100</td>
<td>1,100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICC</td>
<td>0.562 (.038)</td>
<td>0.555 (.034)</td>
<td>0.556 (.034)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIC</td>
<td>5073.122</td>
<td>5008.779</td>
<td>5006.811</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIC</td>
<td>5103.2</td>
<td>5043.8</td>
<td>5046.835</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Refugee Well-being Project (RWP) of the University of New Mexico (2013-17)

+ p<.1, * p<.05, ** p<.01, *** p<.001

Key: coefficient (standard error)

NOTE: for Var and Cov, if 95% C.I. crosses zero, then not significant and indicated above by light grey text.
Table 6a Three Multilevel Growth Models: Education, Age, and Gender separately moderating English Language Acquisition over one year

<table>
<thead>
<tr>
<th>Moderating English Acquisition:</th>
<th>Education¹ Coefficient</th>
<th>Std Err</th>
<th>Age² Coefficient</th>
<th>Std Err</th>
<th>Gender Coefficient</th>
<th>Std Err</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed Effect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept (Constant) (β₀₀)</td>
<td>2.655 *** (.122)</td>
<td></td>
<td>2.604 *** (.132)</td>
<td></td>
<td>3.135 *** (.190)</td>
<td></td>
</tr>
<tr>
<td>Linear Change (β₁₀)</td>
<td>.142 *** (.014)</td>
<td></td>
<td>.141 *** (.013)</td>
<td></td>
<td>.152 *** (.020)</td>
<td></td>
</tr>
<tr>
<td>Time Invariant Covariate</td>
<td>.198 *** (.023)</td>
<td>-.032 ** (.011)</td>
<td></td>
<td>-1.012 *** (.261)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction – TIC with Time</td>
<td>.011 *** (.003)</td>
<td>-.002 * (.001)</td>
<td></td>
<td>-.020 (.027)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quadratic Change</td>
<td>-.003 *** (.001)</td>
<td>-.003 *** (.001)</td>
<td></td>
<td>-.003 * (.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction – TIC with Quad</td>
<td>-.0004 * (.0002)</td>
<td></td>
<td>.000 (.0001)</td>
<td>-.0001 (.002)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Random Effect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Var of growth rate (Time)</td>
<td>.009 (.001)</td>
<td>.010 (.001)</td>
<td>.010 (.001)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Var(Constant)</td>
<td>3.658 (.335)</td>
<td>4.680 (.407)</td>
<td>4.563 (.397)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cov(Time &amp; Constant)</td>
<td>-.057 (.015)</td>
<td>-.029 (.015)</td>
<td>-.024 (.015)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Var(Residual)</td>
<td>.297 (.020)</td>
<td>.288 (.018)</td>
<td>.290 (.019)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Participants N = 290
Observations N = 1,160
ICC .925 (.008) .942 (.006) .940 (.006)
AIC 2,924.524 3,246.964 3,253.891
BIC 2,973.461 3,296.643 3,303.57

Source: Refugee Well-being Project (RWP) of the University of New Mexico (2013-17)

Key: coefficient (standard error)
+ p<.1, * p<.05, ** p<.01, *** p<.001
¹ grand mean centered
² grand mean centered

Note: for Var and Cov, if 95% C.I. crosses zero, then not significant and indicated above by light grey text.

Model 1 = Predicting English Language Acquisition, **Education** - quadratic (grand mean centered, mean education level = 10th grade)
Model 2 = Predicting English Language Acquisition, **Age** (grand mean centered, mean age = 34 years old)
Model 3 = Predicting English Language Acquisition, **Gender** (Female = 1, Male = 0)
Table 6b Multilevel Growth Models: Moderating English Language Acquisition

<table>
<thead>
<tr>
<th>Fixed Effect</th>
<th>Education(^1) with Time</th>
<th>Std Err</th>
<th>+ Age(^1) with Time</th>
<th>Std Err</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept (Constant) (β(_{00}))</td>
<td>2.719 *** (0.121)</td>
<td>2.718 *** (0.120)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear Change (β(_{10}))</td>
<td>0.101 *** (0.007)</td>
<td>0.101 *** (0.007)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education (TIC)</td>
<td>0.207 *** (0.022)</td>
<td>0.208 *** (0.022)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction – Ed with Time</td>
<td>0.005 *** (0.001)</td>
<td>0.005 *** (0.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (TIC)</td>
<td>-0.026 * (0.011)</td>
<td>-0.002 *** (0.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction – Age with Time</td>
<td>0.004 *** (0.001)</td>
<td>0.004 *** (0.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female (TIC)</td>
<td>0.004 *** (0.001)</td>
<td>0.004 *** (0.001)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Random Effect

| Var of growth rate (Time) | .009 (0.001) | .008 (0.001) |
| Var(Constant) | 3.675 (0.338) | 3.585 (0.330) |
| Cov(Time & Constant) | -0.059 (0.015) | -0.066 (0.014) |
| Var(Residual) | .308 (0.020) | .306 (0.020) |

Participants N = 290
Observations N = 1,160
ICC | .923 (0.008) | .921 (0.008)
AIC | 2,939.58 | 2,913.351
BIC | 2,978.73 | 2,962.288

Source: Refugee Well-being Project (RWP) of the University of New Mexico (2013-17)

Key: coefficient (standard error)
+ p<.1, * p<.05, ** p<.01, *** p<.001
\(^1\) grand mean centered

Note: TIC is Time Invariant Covariate; TVC is Time Varying Covariate.

Model 1 = Predicting English Language Acquisition, Education (grand mean centered) interacted with Time (mean education level = 10.36 grade)
Model 2 = Predicting English Language Acquisition, adding Age (grand mean centered) interacted with Time (mean age = 34.60 years old)
Appendix A: Displaced Refugee Populations

From Peter Gatrell’s The Making of the Modern Refugee with additional column for 2017

20th Century Displaced Refugee Population (millions, estimated)

<table>
<thead>
<tr>
<th></th>
<th>WW I Aftermath</th>
<th>WW II Aftermath</th>
<th>Cold War Aftermath</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continental Europe</td>
<td>10 (Eastern Europe)</td>
<td>60</td>
<td>&lt;7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 (Balkans)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-European Countries</td>
<td>n/a</td>
<td>90 (China)</td>
<td>6 (Southeast Asia &amp; Middle East)</td>
<td>65.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 (South Asia)</td>
<td>6 (Sub-Saharan Africa)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 (Middle East)</td>
<td>4 (Other)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 (Other, including Hong Kong)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 (IDPs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global Total</td>
<td>&gt;12</td>
<td>175</td>
<td>47</td>
<td>65.6</td>
</tr>
<tr>
<td>Total World Population</td>
<td>1,800</td>
<td>2,300</td>
<td>5,300</td>
<td>7,400</td>
</tr>
<tr>
<td>Percentage Displaced</td>
<td>&lt; 1.0 %</td>
<td>7.6 %</td>
<td>0.9 %</td>
<td>0.9 %</td>
</tr>
</tbody>
</table>

For WW I and WW II Aftermath: see Chapter 1-6 of Gatrell (2013)
For Cold War Aftermath: 1992-1996 average (see UNHCR data).
For 2017: see UNHCR data
Appendix B: Variables – Questions

Time point of interview (INTTP) 0 = Pre, 1 = Mid, 2 = Post, 3 = Follow-up

A2. Gender (Gender) Male / Female

A3. How old are you? (Age) Range = 18 to 71 years old

A5. When did you move to the U.S.? (WksinUS) Range = 1 to 166 weeks

A6a. What is your nationality? (Nationality) 0=Iraqi; 1=Afghan, 2=African

B1. What is your first language? (FirstLanguage)

B4. Do you know how to read (any language)? (literateYN)

Variable for Education combination of C18 and C19:

range 0-18, with 0 to 12 indicating grade level, 13 = trade school, 14 = some college, 15 = Associates degree, 16 = Bachelor’s degree, and 18 = graduate or professional degree.

C18. What is your educational level now?

Response Options for Education Level:

1. Less than High School
2. High School Grad/GED
3. Trade School Graduate
4. Some College (no degree)
5. Associate’s Degree (2-year)
6. Bachelor’s Degree (4-year)
7. Graduate or Professional Degree

C19. What is the highest grade that you have finished? 0-12

Variable for Positive Mental Health (Psychological Health) Scale

Section of World Health Organization Quality of Life assessment (WHOQOL; The WHOQOL Group, 1998)

Range: 3-15

Calculate: mean (three questions), then multiplied by 3

Scored on scale of 1-5: Not at All (1), A Little (2), A Moderate Amount (3), Very Much (4), An Extreme Amount (5).

I5. How much do you enjoy your life? (In the last four weeks)

I6. To what extent do you feel your life to be meaningful? (In the last four weeks)

I7. How well are you able to concentrate? (In the last four weeks)
Appendix C: Variable – Scale for Psychological Distress

Hopkins Symptoms Checklist-25 (HSCL-25)

The three scores of the HSCL-25 are: a total score (mean of all items), a depression score (mean of the 15 depression items), and an anxiety score (mean of the 10 anxiety items).

Note: Item 14 (“Loss of sexual interest or pleasure”) was omitted because the research team decided it was too sensitive to ask of recently arrived refugees. Thus there are only 24 items, instead of 25.

Range: 1-4

Response Options for HSCL: 1 = Not at all  
2 = A little  
3 = Quite a bit  
4 = Extremely

Questions for HSCL:

K1. Suddenly scared for no reason in the last week
K2. Feeling fearful in the last week
K3. Faintness, dizziness, or weakness in the last week
K4. Nervousness or shakiness inside in the last week
K5. Heart pounding or racing in the last week
K6. Trembling in the last week
K7. Feeling tense or keyed up in the last week
K8. Headaches in the last week
K9. Spells of terror or panic in the last week
K10. Feeling restless, can’t sit still in the last week
K11. Feeling low in energy, slowed down in the last week
K12. Blaming yourself for things in the last week
K13. Crying easily in the last week
K14. Poor appetite in the last week
K15. Difficulty falling asleep, staying asleep in the last week
K16. Feeling hopeless about the future in the last week
K17. Feeling blue in the last week
K18. Feeling lonely in the last week
K19. Thoughts of ending your life in the last week
K20. Feeling of being trapped or caught in the last week
K21. Worrying too much about things in the last week
K22. Feeling no interest in things in the last week
K23. Feeling everything is an effort in the last week
K24. Feeling of worthlessness in the last week
Appendix D: Variable – Scale for Prior Trauma Exposure

Trauma Exposure Scale was created specifically for RWP study, includes questions from Weine’s trauma exposure, Harvard Trauma Questionnaire, and Foa’s PTSD measure.

**Response Options for Trauma Exposure Scale:** Yes=1; No=0

**Range for Trauma Exposure Scale:** 0-27

**Method of calculating measure:** PriorTraumaExp = Sum (L1 through L27)

**Questions for Trauma Exposure Scale:**

L1. Serious accident, fire or explosion?
L2. Natural disaster (tornado, flood, hurricane, major earthquake, extreme drought)?
L3. A serious problem with adequate living condition (food, clothing, shelter)?
L4. A serious change in your social status (employment, role in organizations)?
L5. Fear for your own life?
L6. Fear for the life of a loved one?
L7. A serious physical wound?
L8. Physical assaults, beatings, or torture?
L9. A serious betrayal by a close friend, neighbor, or coworker?
L10. Imprisonment (including being held in a concentration camp)?
L11. The untimely death of a family member or loved one?
L12. Suicide of a family member or loved one?
L13. Separation from a family member or loved one?
L14. The destruction of your home?
L15. The destruction of your community?
L16. Being forced to leave your home?
L17. The loss of important materials or goods?
L18. Experienced bombings, shootings associated with military or paramilitary forces?
L19. Family member or loved ones participating in combat?
L20. Being witness to a violent death?
L21. Being witness to a physical assault, beatings, or torture?
L22. Being witness to a sexual assault?
L23. Being a victim of a sexual assault?
L24. Life-threatening illness?
L25. Ill health without access to medical care?
L26. Extortion or robbery?
L27. Being kidnapped or threatened to be kidnapped?
Appendix E: Formulas and Syntax

These are the remaining formulas and syntax continued from pages 25-27 with the variables of age and education, as well as models with psychological distress (PD) and mental health (MH) as both independent and dependent variables, and then the final built model.

**Model 3a:** Model with Level-2 variable with random slope of time

**Level 1 – Within Individual (time varying)**

\[
\text{EngLevel}_{ii} = \pi_{0i} + \pi_{1i} \text{Time}_{ti} + \epsilon_{ti}
\]

**Level 2 – Between Individuals (time invariant)**

\[
\pi_{0i} = \beta_{00} + \beta_{10} (\text{age}) + \epsilon_{0i}
\]

\[
\pi_{1i} = \beta_{10} + \epsilon_{1i}
\]

Stata Command: `mixed englevel age time||id:time, var cov(unstr)`

**Model 3b:** Linear growth model interaction of Level-2 variable with time

**Level 1 – Within Individual (time varying)**

\[
\text{EngLevel}_{ii} = \pi_{0i} + \pi_{1i} \text{Time}_{ti} + \epsilon_{ti}
\]

**Level 2 – Between Individuals (time invariant)**

\[
\pi_{0i} = \beta_{00} + \beta_{10} (\text{age}) + \epsilon_{0i}
\]

\[
\pi_{1i} = \beta_{10} + \beta_{11} (\text{age}) + \epsilon_{1i}
\]

Stata Command: `mixed englevel age##time ||id:time, var cov(un) mle`

**Model 3c:** Quadratic growth model interaction of Level-2 variable with time

**Level 1 – Within Individual (time varying)**

\[
\text{EngLevel}_{ii} = \pi_{0i} + \pi_{1i} \text{Time}_{ti} + \pi_{2i} \text{Time}_{ti} \#\# \text{Time}_{ti} + \epsilon_{ti}
\]

**Level 2 – Between Individuals (time invariant)**

\[
\pi_{0i} = \beta_{00} + \beta_{10} (\text{age}) + \epsilon_{0i}
\]

\[
\pi_{1i} = \beta_{10} + \beta_{11} (\text{age}) + \epsilon_{1i}
\]

\[
\pi_{2i} = \beta_{20} + \beta_{12} (\text{age})
\]

Stata Command: `mixed englevel age##time##time ||id:time, var cov(un) mle`
Model 4a: Model with Level-2 variable (with random slope of time)

Level 1 – Within Individual (time varying)

\[ \text{EngLevel}_{ti} = \pi_{0i} + \pi_{1i} \text{Time}_{ti} + \epsilon_{ti} \]

Level 2 – Between Individuals (time invariant)

\[ \pi_{0i} = \beta_{00} + \beta_{10} (\text{education}) + r_{0i} \]
\[ \pi_{1i} = \beta_{10} + r_{1i} \]

Stata Command: `mixed englevel education time##id:time, var cov(un)`

Model 4b: Linear growth model interaction of Level-2 variable with time

Level 1 – Within Individual (time varying)

\[ \text{EngLevel}_{ti} = \pi_{0i} + \pi_{1i} \text{Time}_{ti} + \epsilon_{ti} \]

Level 2 – Between Individuals (time invariant)

\[ \pi_{0i} = \beta_{00} + \beta_{10} (\text{education}) + r_{0i} \]
\[ \pi_{1i} = \beta_{10} + \beta_{11} (\text{education}) + r_{1i} \]

Stata Command: `mixed englevel education##time ##id:time, var cov(un)`

Model 4c: Quadratic growth model interaction of Level-2 variable with time

Level 1 – Within Individual (time varying)

\[ \text{EngLevel}_{ti} = \pi_{0i} + \pi_{1i} \text{Time}_{ti} + \pi_{2i} \text{Time}_{ti}##\text{Time}_{ti} + \epsilon_{ti} \]

Level 2 – Between Individuals (time invariant)

\[ \pi_{0i} = \beta_{00} + \beta_{10} (\text{education}) + r_{0i} \]
\[ \pi_{1i} = \beta_{10} + \beta_{11} (\text{education}) + r_{1i} \]
\[ \pi_{2i} = \beta_{20} + \beta_{12} (\text{education}) \]

Stata Command: `mixed englevel education##time##time##id:time, var cov(un) mle`

Model 5a: Model with Level-2 variable (with random slope of time)

Level 1 – Within Individual (time varying)

\[ \text{EngLevel}_{ti} = \pi_{0i} + \pi_{1i} \text{Time}_{ti} + \epsilon_{ti} \]

Level 2 – Between Individuals (time invariant)
\[
\begin{align*}
\pi_{0i} &= \beta_{00} + \beta_{10} \text{(initialPD)} + r_{0i} \\
\pi_{1i} &= \beta_{10} + r_{1i}
\end{align*}
\]

Stata Command: `mixed englevel initialPD time||id:time, var cov(un)`

**Model 5b**: Linear growth model interaction of Level-2 variable with time

**Level 1 – Within Individual (time varying)**

\[\text{EngLevel}_i = \pi_{0i} + \pi_{1i} \text{Time}_i + e_i\]

**Level 2 – Between Individuals (time invariant)**

\[
\begin{align*}
\pi_{0i} &= \beta_{00} + \beta_{10} \text{(initialPD)} + r_{0i} \\
\pi_{1i} &= \beta_{10} + \beta_{11} \text{(initialPD)} + r_{1i}
\end{align*}
\]

Stata Command: `mixed englevel initialPD##time ||id:time, var cov(un)`

**Model 6a**: unconditional model of PD as dependent variable

**Level 1 – time varying**

\[\text{PD}_i = \pi_{0i} + \pi_{1i} \text{Time}_i + e_i\]

**Level 2 – Between Individuals (time invariant)**

\[
\begin{align*}
\pi_{0i} &= \beta_{00} + r_{0i} \\
\pi_{1i} &= \beta_{10} + r_{1i}
\end{align*}
\]

Stata Command: `mixed PD time ||id:time, var cov(unstr)`

**Model 6b**: Model with Level-2 variable, random slope of time (Reverse directionality: Initial EngLevel as IV and PD as DV)

**Level 1 – Within Individual (time varying)**

\[\text{PD}_i = \pi_{0i} + \pi_{1i} \text{Time}_i + e_i\]

**Level 2 – Between Individuals (time invariant)**

\[
\begin{align*}
\pi_{0i} &= \beta_{00} + \beta_{10} \text{(initialEngLevel)} + r_{0i} \\
\pi_{1i} &= \beta_{10} + r_{1i}
\end{align*}
\]

Stata Command: `mixed PD initialEngLevel time||id:time, var cov(un)`

**Model 6c**: Linear growth model interaction of Level-2 variable with time

**Level 1 – Within Individual (time varying)**
PD_{ti} = \pi_{0i} + \pi_{1i} \text{Time}_{ti} + e_{ti}

Level 2 – Between Individuals (time invariant)

\pi_{0i} = \beta_{00} + \beta_{10} (\text{initialEngLevel}) + r_{0i}
\pi_{1i} = \beta_{10} + \beta_{11} (\text{initialEngLevel}) + r_{1i}

Stata Command: mixed PD initialEngLevel##time ||id:time, var cov(un)

Model 7a: Model with Level-2 variable (with random slope of time)

Level 1 – Within Individual (time varying)

EngLevel_{ti} = \pi_{0i} + \pi_{1i} \text{Time}_{ti} + e_{ti}

Level 2 – Between Individuals (time invariant)

\pi_{0i} = \beta_{00} + \beta_{10} (\text{initialMH}) + r_{0i}
\pi_{1i} = \beta_{10} + r_{1i}

Stata Command: mixed englevel initialMH##time ||id:time, var cov(un)

Model 7b: Linear growth model interaction of Level-2 variable with time

Level 1 – Within Individual (time varying)

EngLevel_{ti} = \pi_{0i} + \pi_{1i} \text{Time}_{ti} + e_{ti}

Level 2 – Between Individuals (time invariant)

\pi_{0i} = \beta_{00} + \beta_{10} (\text{initialMH}) + r_{0i}
\pi_{1i} = \beta_{10} + \beta_{11} (\text{initialMH}) + r_{1i}

Stata Command: mixed englevel initialMH##time ||id:time, var cov(un)

Model 8a: unconditional model of MH as dependent variable

Level 1 – time varying

MH_{ti} = \pi_{0i} + \pi_{1i} \text{Time}_{ti} + e_{ti}

Level 2 – Between Individuals (time invariant)

\pi_{0i} = \beta_{00} + r_{0i}
\pi_{1i} = \beta_{10} + r_{1i}

Stata Command: mixed MH time ||id:time, var cov(unstr)
**Model 8b**: Model with Level-2 variable, random slope of time
(Reverse directionality: Initial EngLevel as IV and MH as DV)

**Level 1 – Within Individual (time varying)**
\[ MH_{ti} = \pi_{0i} + \pi_{1i} \text{Time}_{ti} + e_{ti} \]

**Level 2 – Between Individuals (time invariant)**
\[ \pi_{0i} = \beta_{00} + \beta_{10} \text{(initialEngLevel)} + r_{0i} \]
\[ \pi_{1i} = \beta_{10} + r_{1i} \]

Stata Command: `mixed MH initialEngLevel time||id:time, var cov(un)`

**Model 8c**: Linear growth model interaction of Level-2 variable with time

**Level 1 – Within Individual (time varying)**
\[ MH_{ti} = \pi_{0i} + \pi_{1i} \text{Time}_{ti} + e_{ti} \]

**Level 2 – Between Individuals (time invariant)**
\[ \pi_{0i} = \beta_{00} + \beta_{10} \text{(initialEngLevel)} + r_{0i} \]
\[ \pi_{1i} = \beta_{10} + \beta_{11} \text{(initialEngLevel)} + r_{1i} \]

Stata Command: `mixed MH initialEngLevel##time||id:time, var cov(un)`
References


