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Individual Differences, L2 Development, and Language Program Administration: From Theory to Application

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Chapter 6
Older Adult Learners and SLA: Age in a New Light

Jessica Cox, Georgetown University

"If you don't keep learning you're going to vegetate. And then life is not worth living."

—Interview subject on her involvement with Elderhostel programs (Long & Zoller-Hodges, 1995)

Older adults, often defined as adults between the ages of 55 and 80, constitute a growing sector of the worldwide population: in 2020, older adults in the U.S. are projected to number 97.8 million, forming 28.7 percent of the population (Toossi, 2012). Although they may no longer be employed, today's older adults remain active physically, socially, and mentally. One activity many seek out is enrolling in courses to learn new skills or subjects. The reasons for which older adults engage in learning are diverse and numerous. Learning communities provide social interaction, mental exercise, physical exercise (traveling to the institution's location), as well as a chance to either build on previous knowledge or pursue interests that had been put aside in young adulthood (Findsen, 2005). Moreover, in 1990, older adults were 26.4 percent of the civilian workforce, whereas by 2010 their representation had increased to 31.4 percent and is projected to reach 36.6 percent by 2020 (Toossi, 2012); therefore there is a growing demand for skill training to remain up-to-date with their profession and to continue receiving promotions. When Western countries recognized the needs described above and first opened institutions and programs directed at older adult learners in the 1970s and 1980s, educators quickly discovered that some of the keystones of formal education of younger adults, such as mandatory attendance and large amounts of written work, were not effective for and even resented by the older generation for both personal and cognitive reasons (Glendenning, 2000). Since then, educators have striven to address the needs of the older population that arise from their personal goals as well as the changes brought by cognitive aging. For these reasons, research in education and cognitive psychology has made important contributions to this field.

Older adults enroll in language classes for any of the general reasons listed above, as well as for practical reasons, such as travel abroad (Mohn, 2012), immigration (Hubenthal, 2004), for service in the Peace Corps (Guntermann, 1995) or a religious mission (Scott, 1994). In addition, research suggests that bilingualism may be a safeguard against dementia and Alzheimer's disease (Bialystok, Craik, & Freeman, 2007; Schweizer, Ware, Fischer, Craik, & Bialystok, 2011), which has been recently reported in many newspaper feature articles (e.g., Dell'Amore, 2011; Bhattacharjee, 2012). This has likely contributed to the increase in older adults interested in pursuing foreign language studies.

In recent years, older adult learners have campaigned to be integrated into higher education institutions with traditionally aged students rather than

relegated to special programs (American Council on Education, 2008). Currently, older adults constitute 2–6 percent of the U.S. population enrolled in courses for credit at degree-granting institutions, with the highest enrollment in private for-profit four-year institutions and public two-year institutions (American Council on Education, 2008). This percentage can only be expected to increase as the population of healthy, active retirees increases. Since older adult learning is still understudied in the U.S., we do not currently have data on the number of older adults in foreign language classes, but we know from the reports mentioned above that older adults are interested in languages; in fact, in Poland, where they do track this data, foreign languages are the third most popular field of study for older adults (Singleton & Ryan, 2004). It then follows that older adult language learners will follow the trend to pursue intergenerational learning in mainstream university classrooms, rather than stay with only those offered at lifelong learning institutes. Therefore, it behooves university language program coordinators to prepare for this future reality (Joiner, 1981). In addition, given that recommendations for healthy aging are to remain active both mentally and physically (Einstein & McDaniel, 2004), as instructors and program coordinators, our service to the aging community can be in providing challenging, yet age-appropriate, environments through intergenerational language classes.

Despite the fact that age of acquisition has long been a factor of interest to the second language acquisition (SLA) field, and although researchers have been calling for studies focusing on older adult learners of non-primary languages since the 1970s (e.g., Kalfus, 1977; Brändle, 1986), very little research in linguistics and SLA has investigated this specific population, especially in terms of controlled laboratory and classroom studies. Clearly, education and psychology studies have implications for the second or foreign language classroom, but the idiosyncrasy of language learning warrants further investigation. Older adult age is of scientific interest to SLA because it is an individual difference (ID) that in turn affects many other affective and cognitive IDs; it is an additional way in which we as researchers can observe language and cognition interacting. It is a topic also of pedagogic interest, since little is known about how to maximize older adults' learning of non-primary languages (e.g., Singleton & Ryan, 2004). To that end, this chapter reviews work on older adults' learning from education and psychology (both early studies that laid the groundwork for our current understanding of older adult learning as well as more recent studies, where they exist, which build upon the early base), as well as the relevant language-learning research from SLA, to give suggestions and implications for language classrooms that include older adults. The chapter concludes by suggesting fruitful areas of future research for the SLA community.

Findings from Education

While the foundation of educational philosophy is *pedagogy* (i.e., the education of children), modern educators have also developed the philosophy of *andragogy* to distinguish the differences between adult and child education. However,

a uniform philosophy for older adult education has yet to be developed. While older adult students generally share some of the characteristics that differentiate middle-aged adult students from children and young adults, such as financial independence and greater life experience, there are also differences between middle-aged and older adult groups: older adults have a different average state of health, may be suffering a loss of community due to deaths of friends and family members, and face limitations inherent to their generation (e.g., often limited familiarity with technology, possibly limited access to education at a younger age). Because of these differences, the term *gerogogy* is often used to refer to older adult education specifically. It is important to note, however, that the extent to which an older adult is affected by any one of the above factors varies from individual to individual, thus rendering this group at least as heterogeneous, if not more so, than other demographic groups of learners. Despite the differences between age groups, the two primary goals of education, effectiveness and efficiency, remain true for all age groups (Peterson, 1983). Therefore, gerogogy aims not only to teach older adults in a way that fits with their abilities, but to also help them maintain a cognitively active lifestyle, since that has been associated with successful aging (Einstein & McDaniel, 2004).

There are, nevertheless, opponents to current models of gerogogy. Cruikshank (2003) states that "models of productive aging or 'good aging' are inherently coercive" and that "nearly always they are proposed by the non-old" (p. 163). Furthermore, she suggests that current programs aim to occupy senior citizens' time while confining them to the fringes of university life at the institution at which they are enrolled. She proposes that instead, older adults should form an integral part of the formation and direction of the programs designed for them. Older adults have since taken this philosophy one step farther, by arguing for intergenerational programs where they are integrated with young adult students (American Council on Education, 2008), so demand for integrated-age group classes is likely to increase in the near future.

Moving from theory to research, a look at representative studies in education shows evidence of the learning outcomes and teaching methods in classes with older adults. For example, Long and Zoller-Hodges (1995) interviewed 12 older women regarding their learning outcomes from participation in a program run by Elderhostel, a non-profit organization offering educational programs for older adults. Interviews were coded for six broad themes of outcomes and 11 narrower themes: Appreciation (of others, of another culture, of history, and of self), Elderhostel support (from self and for recruiting others to participate), Social contact, Travel, Learning (specific content and general perception), and Inspiration to pursue follow-up activities. Every theme was mentioned by at least three interviewees and all interviewees mentioned multiple themes, suggesting a rich learning experience. The authors conclude that the program satisfied participants and fulfilled many of their needs, although they do not mention any reports of less than satisfactory aspects of the program. Nevertheless, the study shows that provision of learning opportunities to older adults is valuable to them and suggests that it in turn benefits society by aiding this sector of the population.

Taking a more concurrent approach, Ballester, Orte, March, and Oliver (2005) analyzed discourse between teachers and older adults in the classroom as the interlocutors constructed joint knowledge. The students built their joint understanding of human lifecycles (the subject of the course) by asking each other serious questions, with the teacher intervening only with questions to open the floor or comments to summarize arguments. This method allowed learners to share their own life experiences and work to come to a common understanding of multiple perspectives, which the teacher then related to the scientific or sociological information under study. Thus, older adults were accepted into the classroom as important sources of knowledge, so that they saw the new information as it pertains to them and their peers, not as an outside force threatening to invalidate their experiences.

Murray (2011) reported on a language education program for older adults in Japan interested in learning in English. The language center is self-access, and other than seminars introducing the center, there are no classes. Instead, learners identify their own goals, choose and use materials provided by the center, and assess their learning outcomes. The materials include printed and audiovisual sources and consultations with language tutors. The center also offers conversation groups and social events. Murray reported insights garnered from interviews with and observations of four older adult learners at the center. The learners' general perception of their experience at the center was positive, due to their autonomy and ability to experiment with different learning methods and strategies, as well as the sense of community they found there. The challenges they reported included declines in hearing, vision, and memory. Beyond the physical and cognitive challenges, they also often had fewer opportunities to practice their new language skills outside of the center than their younger counterparts. However, this study does not report the effects of these differences on learning outcomes.

In summary, educational philosophy and research show that while it is difficult to generalize across a diverse group, even when limiting the age range to older adults, it is clear that the members of this demographic group are capable of learning and often associate great benefits with learning. Their learning experiences are enhanced by their life experiences and the life skills they have acquired, such as independent thinking and metacognition. As a result, learning experiences for older adults are not limited to acquiring factual information; they can also have great social, mental, and even spiritual impact. Nevertheless, these learning experiences are necessarily shaped by the effects of cognitive aging, as hinted at in Murray (2011) and explored in the next section.

Findings from Cognitive Psychology

Psychology has identified four main areas of cognition in which older adults differ from younger adults: sensory function, inhibitory control, working memory capacity (WMC), and processing speed (Park, 2000). In addition, the stereotype that older adults are unable to remember new information can increase anxiety in an instructional context, thus further inhibiting performance (McDaniel, Einstein, & Jacoby, 2008). These five factors have implications for older adults'

learning: Sensory function is necessary for perceiving aural and visual input, inhibitory control is important for focusing on helpful information and ignoring distractions, WMC is essential for maintaining information from multiple stimuli, and processing speed determines learners' swiftness in taking in new information and applying it to new scenarios. Therefore, materials and classes with older adult students need to keep these limitations into account.

Peterson's (1983) summary of previous research on the various abilities needed for learning is still a valid view of change across the lifespan. In a nutshell: verbal abilities are generally constant throughout one's 60s and 70s; at the age of 81, participants' verbal scores were still 70 percent of what they had been at age 25. Sociocultural knowledge also generally does not decline until after the 70s, meaning that older adults still know how to interact according to societal norms. At the same time, there is greater individual variation in IQ throughout adult years, suggesting that instructors will find diversity in classrooms of older adults or mixed ages. While Peterson acknowledges that older adults often perceive themselves to be too old to learn, which in turn inhibits their learning, he hopes that the involvement of today's older generation in educational activities will begin to change this negative stereotype of aging for following generations.

Interestingly, the effects of the domain-general cognitive deficits associated with aging may vary according to the type of learning that the task demands: declarative learning, typical of learning dates and facts, tends to show large age effects. In contrast, procedural learning, typical of learning routines and behaviors, uses different resources and shows lesser, and sometimes no, age effects. Since the division between declarative and procedural learning in adult foreign language learning remains contentious (e.g., DeKeyser, 2003; Hulstijn, 2005) and corresponds to different teaching methodologies (e.g., grammar instruction versus communicative teaching, as discussed in DeKeyser, 2012), investigations of these two types of learning in older adults is a valuable starting point for applied linguists and language teachers alike.

Declarative Learning

Beginning then with declarative learning; that is, learning *what* (e.g., facts), Kirasic, Allen, Dobson, and Binder (1996) investigated interactions between IDs of WM, processing speed, and declarative learning in 148 adults aged 65–84. Declarative learning was measured with three tasks: (1) a menu task, in which participants saw a daily menu and then had to determine whether a certain item had appeared on the menu; (2) a bus schedule task, in which participants saw arrival and departure times for a bus, then had to judge whether the travel time given was correct; and (3) a map task, in which participants judged whether an arrow had appeared in the location where a geometric form appeared. Results showed that reaction time (RT) generally increased with age in all tasks, whereas accuracy did not have a direct relationship with age. Structural equation modeling showed that WMC was the main contributor to age effects in declarative learning tasks; the contribution of processing speed was subsumed by that of WMC. The researchers concluded that older adults' declarative learning is greatly impaired by cognitive declines.

More recently, Rahhal, Hasher, and Colcombe (2001) investigated the extent to which age effects in declarative learning tasks are due to instructions emphasizing memory. During training, younger and older adults saw trivia statements and learned whether they were true or false. During testing, participants recalled whether the sentences were true, false, or had not been presented. During both phases, a subset of each group received instructions that emphasized memory and remembering; the rest received instructions that avoided mentioning memory or remembering specifically and instead spoke of learning in general. A significant age effect at testing was found only for the group that had received memory-emphasis instructions, suggesting that the instructions had activated the threat of stereotypical worse memory performance in older adults. Both conditions still represent explicit or declarative learning since both informed participants that they would learn (or memorize) and then be tested; however, this study is limited to findings regarding remembering facts rather than word lists (such as foreign language vocabulary) or grammar patterns.

Procedural Learning

In contrast to the declines in declarative learning, procedural learning (learning of routines and behaviors or learning *how*) seems to be relatively well-maintained in older age, although results vary to some extent depending on the task used in the study. A common task is the Alternating Serial Response Time (ASRT) task, in which participants view and respond to the placement of circles on a screen. Unbeknownst to them, there are more and less frequently repeated sequences of circles. Procedural learning is measured by triplet-type effect: decreased RT and improved accuracy for more frequent sequences as compared to less frequent sequences. Several studies show that while both older and younger adults show procedural learning on the ASRT and Triplet Learning Task (TLT, a similar task), the magnitude of learning for younger groups is greater than for the older groups (Bennett, Howard, & Howard, 2007; Howard & Howard, 1997; Howard et al., 2004; Howard, Howard, Dennis, & Kelly, 2008). This age effect may be due to declining WMC with age; also, the intervening low-frequency events disrupt the learning of the high-frequency sequences, and this disruption may have a greater effect on older adults' procedural learning than that of younger adults.

Howard et al. (2004) increased the amount of disruption in between patterned events in the ASRT. In their lag-2 structures, there is one random stimulus intervening between each patterned stimulus; in lag-3, there are two such random stimuli. The results from lag-2 structures paralleled those of Howard & Howard (1997), even at the final sessions, showing age effects. For lag-3 structures, while young adults showed learning in terms of trial-type effects in RT and accuracy that increased with time (although much smaller effects than found with lag-2), older adults showed both trial-type effects but there was no change with time. The authors suggest that older adults' very limited lag-3 learning has important implications for real-life sensitivities to learning higher-order patterns, ranging from learning routines needed to use new computer software to sensitivity to foreign language grammar patterns.

Supra-span tasks (i.e., recall tasks designed to go beyond an individual's WM span) have also been considered measures of procedural learning. Turcotte, Gagnon, and Porier (2005) compared younger and older adult performance on supra-span tasks with verbal and visuospatial stimuli. In Experiment 1, participants saw sequences of words (familiar items) or nonwords (unfamiliar items); one sequence was repeated in the task while others did not repeat. For word stimuli, there were no age differences; all participants had equivalent recall and all recalled the repeated sequence better than the random sequences. For nonword stimuli, younger adults had better recall than older adults, but the difference in accuracy between repeated and random sequences was equivalent across age groups. Comparing the two types of stimuli, then, it does not seem that recall in either age group was dependent on prior familiarity. In Experiment 2, similar participants completed a visuospatial supra-span task in which squares appeared on the computer screen in random sequences, with one sequence repeating throughout the task. Younger adults recalled the repeated sequence significantly more accurately than they did the random sequences, but there was no such difference in older adults' performance; thus, age had an effect on learning. The less apparent age differences in verbal tasks, even with unfamiliar words, suggest that procedural language learning may not be as impaired as visuospatial learning, although one cannot extend this to linguistic domains beyond the lexicon based on this research.

In addition, the extent to which age differences in procedural learning are behavioral or neural in nature, or both, is still debated. Daselaar, Rombouts, Veltman, Raaijmakers, and Jonker (2003) found only behavioral, and not neural activation, age effects in the ASRT with fMRI imaging when comparing men aged 30–35 and men aged 63–71. Crucially, fMRI results showed different brain areas activated for patterned versus random trials, but these areas did not differ by age group or by session. However, this study's younger group was not as young as is typically used (age 18–25), so it may be that comparison of more extreme groups would yield different results. Indeed, Rieckmann, Fischer, and Bäckman (2010) found equivalent sequence learning in younger and older adults on the SRT (a deterministic second-order sequence), while they did find differences in neural activations. For younger adults, higher levels of learning over time were associated with increased activation in striatum and decreased activation in the medial-temporal lobes (MTL). For older adults, higher levels of learning over time were associated with increased activations in both the striatum and MTL. Thus, it seems that older adults are able to use the MTL to compensate for the natural decay of the striatum due to aging, at least when the sequence is relatively simple; in turn, this may also help explain why age effects are found with more complex structures: the MTL is less well equipped to compensate in those cases (Rieckmann & Bäckman, 2009).

To summarize, the picture with procedural learning is less clear than it is for declarative learning. While older adults are often capable of procedural learning, there are still age effects found in many cases, especially when the sequence to be learned is complex. The following section aims to examine the issue more closely by seeing whether explicit instruction (which prompts declarative learning) aids or hurts older adult learners.

Comparing Instructional Conditions

When comparing instructed to non-instructed conditions of younger and older adults, instruction has not been shown to help older adults' learning and in fact often diminishes it. Howard and Howard (2001) used the ASRT with younger and older adults, dividing each age group into incidental and intentional conditions. In the intentional condition, participants were told that every other target followed a pattern and that discovering it might improve their RTs. Participants in the incidental condition were only told that researchers were interested in seeing how RT improves with practice. Both age groups showed procedural learning. Overall, older adults' learning increased less across sessions than younger adults', and crucially, the older intentional group showed less of a triplet-type effect than the older incidental group, whereas there were no differences between instructional conditions for younger adults. Likewise, the session in which older participants first demonstrated learning (as measured by either RT or accuracy) was later in the instructional condition than in the intentional, whereas there was no significant difference for younger adults. The negative effect of older adults' trying to find the rule may be explained by the fact that two-thirds of the young adults in the intentional condition reported partial or full explicit knowledge of the pattern, whereas none of the older intentional participants did. Therefore, it may be that trying to find the pattern overloaded the older adults' cognitive capacities and limited their learning of the pattern as well as their developing awareness of the pattern.

Song, Marks, Howard, and Howard (2009) investigated whether procedural learning is affected by providing explicit information for some events. The researchers modified the ASRT to provide cues in some blocks to prompt declarative learning in them while still maintaining some cue-less blocks (Probe blocks) to measure procedural learning in the same individual. The cues were the color of the target: in Cued blocks, Pattern trials were grey while Random trials were black. In Probe blocks, all trials were black. Half the participants constituted the Intentional group and were told that the Cued blocks followed a pattern, and after every block they were asked to report or guess at the pattern. The other half were Incidental and were told that Cued blocks were to help distinguish between trials. Results showed that explicit instructions on Cued blocks did affect performance on Cued blocks (in terms of RT but not accuracy), but played no role in RT or accuracy on Probe blocks, that is, on procedural learning. Therefore, it seems that providing explicit information about one feature of the task affects performance on that feature (with the effect interacting with age), while performance on other task features are not inhibited (in this case, procedural sequence learning).

Gagnon, Bédard, and Turcotte (2005) also used incidental and intentional conditions with young adults and older adults but with a supra-span learning task in which participants viewed sequences of blocks appearing on a computer screen and then had to recall the sequence of the blocks. Sequence length was two items more than a participant's individual span score on a prior WM span test using the same type of stimuli. Participants in the intentional condition were told that a pattern would be repeated and saw an asterisk on the screen during

pattern trials. Incidental participants were only told that they would recall the sequences they saw. Younger adults outperformed older adults in both conditions. Within the older participants, there was no difference in instructional condition; across conditions, accuracy in pattern trials when compared to random trials only approached significance. Therefore, it seems that having explicit instructions neither contributed to nor reduced learning in older adults in this study.

Approaching a linguistic task, Midford and Kirsner (2005) compared younger and older adults' grammaticality judgments of complex versus simple artificial grammars (AGs) in two instructional conditions: with prior explanations and without. In conditions with rule explanations, participants were presented with the diagram of the AG, worked through progressively more difficult examples of grammatical strings, and then produced three examples of their own. In conditions without rule explanations, participants were told to learn and remember what they saw. At testing, all participants judged whether strings were grammatical or not. Results showed that older adults had consistently slower RTs than the younger adults in the corresponding condition. For accuracy, the [+complex, −rules] group was the only condition in which there were no age effects and both age groups performed above chance. The greatest age difference occurred in the [−complex, +rules] condition, in which younger outperformed older adults. In both age groups, accuracy in the [+complex, +rules] condition was not statistically greater than chance. These results suggest that procedural learning is well maintained for learning complex language-like information, whereas older adults have difficulty making use of explicit information provided to them. Young adults show the same difficulty when the rules are complex.

To conclude, it is difficult at this point to decide the exact extent to which procedural learning is maintained in older adults, but it is relatively clear that older adults tend to perform better in implicit rather than explicit conditions for the same task, while the opposite is often true for younger adults. Moreover, Midford and Kirsner (2005) provide important evidence that adult language learning may follow the same interaction with age and type of instruction seen in various cognitive psychology studies. This interaction can be explained by the cognitive effects of aging, such as limited WMC and slower processing speed, which make it harder for older participants to capitalize on explicit information, as well as the negative self-perceptions that can be activated if older adults are told that they will be tested on what they are taught. However, learning conditions in psychology studies are rarely parallel to the environments in which everyday language learning occurs, so it is necessary to expand the work to SLA.

Findings from SLA

There are some studies investigating how older adults learn non-primary languages, but the field still lacks a comprehensive strand of research in this area. Nevertheless, it is useful to consider what has been done to apply findings to date to today's classrooms, as well as to consider what direction future research should take. Linguists have approached the problem from sociocultural and cognitive

points of view, with the latter including lexical and, to a limited extent, morpho-syntactic studies.

To begin to answer the primary question of whether older adults still have the cognitive ability to learn language, Scott (1994) investigated the language aptitude (operationalized as auditory perception and auditory memory span) of younger and older adults who had been missionaries of the Church of Latter-Day Saints in either English-speaking countries (monolingual participants) or Spanish-speaking countries (bilingual participants). Participants completed tests of L1 (English) and L2 (Spanish) aural perception, L1 and L2 WMC, L2 phoneme discrimination, listening comprehension, and vocabulary recognition. Note that for monolingual participants, the L2 tasks were completely novel. On the L1 auditory perception tasks, younger adults outperformed older, with no effect for language experience. However, on the L1 auditory memory span tasks, bilinguals significantly outperformed monolinguals while there was no age difference. Not surprisingly, young adults outperformed older adults on L2 auditory perception, although the older monolinguals still scored an average of 80 percent. With L2 proficiency controlled for, there were no significant age differences on the L2 discrimination tasks. Scott concludes that while younger adults may have advantages, older adults still show the aptitude necessary for language learning, at least in terms of auditory WM.

Taking a sociolinguistic approach to SLA, Andrew (2012) investigated the learning environment of seven English as a Foreign Language learners in Mexico: two older men, four middle-aged women, and one male young adult. Andrew reports from interviews and classroom observation with the older learners (age 68 and 69, both retired professionals) that they found increased status in the community for knowing two languages, and in addition to the immediate goal of wanting to learn English, had the goal of continuing to exercise their minds. Although both cited early childhood as the best time to learn a second language, both also saw advantages that they had above their classmates: increased economic resources, available time, and life experience to rely on, plus enthusiasm that comes from having entirely intrinsic motivation. The challenges they faced in the classroom included physical detriment (hearing impairment, talking with dentures), the materials that assume a younger student (e.g., "My mother/father drives me crazy when…."), and that they expect to be the authority in the community, given their gender and age, but are not always treated as such by the instructor or fellow students. Thus, social factors are important for teachers to consider alongside the cognitive effects of aging in the language classroom.

Lexicon

Service and Craik (1993) investigated the role of aging in vocabulary learning where items were English pseudowords (phonologically familiar) and Finnish words (phonologically unfamiliar). Stimuli were presented aurally, each preceded by the English translation (invented for the pseudowords), and the participant repeated each item aloud. The fourth repetition of the list was an immediate posttest and showed that younger participants had better recall and that English-sounding words were recalled better. More specifically, increase in recall for familiar words was greater in younger than older adults. For younger participants, score on an explicit memory

test accounted for 33 percent of the variation in recall; for the older adults, it accounted for 58 percent of the variation. For older participants but not younger, the score on a phonological memory test (repeating back Finnish words) also contributed to the variation in recall. The age differences in overall learning might be related to successful strategy use: both groups reported attempting to link the new words with known English words, but older adults reported frustration in such attempts. Thus, their recall was based more on phonological than semantic memory.

Van der Hoeven and de Bot (2012) investigated lexical learning of both new and previously learned items by young adults, middle-aged adults, and older adults. All participants spoke Dutch as their L1 and had learned French in the past. The test consisted of translating French words into Dutch; old items were frequently used in L2 classrooms and new items were pseudowords. After the pretest, participants studied flashcards of 20 real words that they had not translated correctly and 20 pseudowords and took an immediate posttest. Two weeks later, they took a delayed posttest and a measure of WMC. There were no effects for age in accuracy of translating old words, but for new words, younger adults outperformed the two other age groups. Posttest scores for old and new words were positively correlated with WMC in all age groups, but savings scores did not correlate with WMC in any group. All groups used mnemonic strategies when studying the flashcards, but middle-aged and older adults often did not remember their associations at the delayed posttest; thus, the age difference may be due more to declines in declarative learning processes than in semantic (lexical) storage.

Also in the area of lexical learning, Whiting, Chenery, and Copland (2011) taught younger and older adults new names for familiar and unfamiliar objects in an explicit condition. In Experiment 1, half the objects were of high name frequency and half were low name frequency. Each was randomly assigned a pseudoword name. During the learning sessions, stimuli were presented on the computer screen with their names for 5 seconds each. Each session ended with recall and recognition tasks. For recall, participants saw the drawing of the item without its label and typed in the nonword name. In the recognition task, participants saw the drawing of an item and a pseudoword name, and had to decide whether the name was correct or incorrect. Analyses of the recall data showed a learning effect with accuracy improving in each session, and no age effects in learning sessions or posttests. Analyses of the recognition data largely followed the same patterns. RT in the recognition tasks decreased over the learning sessions; at both the one-week and one-month delayed posttests, younger adults responded significantly more quickly than older adults. Experiment 2 increased task demands by making all items unfamiliar objects: thus, participants had to form semantic form-meaning connections, whereas in Experiment 1 they could have made nonword-English word connections. Experiment 2 used the same participants and procedure, except the drawings were presented with a description (e.g., "tool for catching small animals") as well as the nonword name, and description recognition was also tested. Results showed the same patterns in Experiment 1, with the exception that younger adults' RTs began to be significantly different from older adults' during the learning sessions. In addition, there were age effects in the description recognition task: younger adults were significantly more

accurate than older adults. The authors conclude that the mechanisms for learning vocabulary may be similar between younger and older adults, and are spared with aging. That young adults had an advantage in the description recognition task, but not the nonword recognition task, of Experiment 2 suggests that they may use semantic strategies for learning new words, whereas older adults may rely more on phonological short-term memory.

Morphosyntax

Moving to morphosyntactic learning, Lenet, Sanz, Lado, Howard, and Howard (2011) is the only study to date to investigate the interaction of aging and learning condition on a miniature natural language. The target was thematic role assignment in Latin. Conditions were operationalized by including metalinguistic feedback (Explicit) versus yes/no feedback (Less Explicit). All groups also received task-essential practice. Learning was measured by four posttests: written and aural interpretation, written production, and grammaticality judgment task (GJT). Older participants who had no prior exposure to Latin ($n = 11$) did not score significantly differently than equally naïve younger learners on immediate or delayed posttests. Interestingly, within the older adult group, those in the Less Explicit condition outperformed those in the Explicit condition on the GJT, which is thought to be a less explicit test. In addition, only the Less Explicit condition showed improvement with time on the written production task and on the composite score. Older participants in the Explicit condition reported that the timing of feedback in general frustrated them, which may have hindered their learning. In contrast, the composite learning score of younger adults showed superior learning over time in the Explicit condition when compared to the Less Explicit. The delay between immediate and delayed posttest sessions was only one week for older adults, so retention is very shortterm in this study, but in general it aligns with Midford and Kirsner (2005), suggesting an Age by Condition interaction.

Mackey and Sachs (2012) investigated the role of WMC on older adults' ability to benefit from negotiation and feedback addressing question formation in English in a classroom setting. Participants were nine older adult Spanish speakers who had emigrated from Latin America (mean length of residence in the U.S.: 17 years). Participants interacted one-on-one with a young adult native speaker of English who had been trained in giving feedback in the form of recasts. Treatment consisted of communicative tasks such as spot-the-difference, picture-drawing, and picture-sequence tasks. Four of the nine participants showed improvement in their question formation at the immediate posttest, and two of them maintained this development on at least one of the delayed posttests. No IDs correlated with immediate development other than L1 listening span: the four participants who improved had the highest listening span scores and the two who showed retention had the highest listening span scores overall. The listening span measure used paralleled Daneman and Carpenter's (1980) task in requiring judgments of plausibility and grammaticality for each item, in addition to storage. This may have made task demands too high for many of the participants. Nevertheless, the results suggest that differential WMC can play a role in language learning outcomes for older adults, as it does for younger adults.

From the limited research to date, it seems that older adults are able to learn non-primary languages, especially lexical items. However, a variety of cognitive factors (such as WMC) and societal factors (such as level of education) can affect their learning. These factors then also have potential implications for differential learning outcomes in different instructional conditions, since conditions and tasks vary in their demands on each ID (Sanz & Lado, 2008). Also, other IDs that have not yet been investigated, such as bilingualism, may moderate the effects of aging on cognition, including non-primary language learning. Finally, very few studies have looked at the learning of morphosyntactic patterns in older adults.

Classroom and Program Implications

The above studies from education, cognitive psychology, and SLA clearly show that the older adult learner is in many ways not the equivalent of other learners. Given the growing trend for older adults to directly enroll in four-year programs (American Council of Education, 2008), language courses need to consider the strengths and limitations of the older adult population in their design, since the presence of that population in these classes is growing. Some results from psychology and education research apply to language classes, but since the nature of the subject matter determines the best practices for teaching (Knowles, Holton, & Swanson, 2011), the uniqueness of language learning also suggests the need for more SLA-specific research. At this point, what can current language practitioners take from research to date to aid in developing and conducting classes that include older adults?

For a theoretical grounding for language classrooms, two relevant teaching methodologies are Processing Instruction (PI) (e.g., VanPatten, 2004) and Task-Based Language Teaching (TBLT) (e.g., Norris, 2009). PI prioritizes practice with language over memorizing grammar rules, thus suiting older adults' better-maintained procedural memory compared to declarative. Also, PI includes instruction on strategies to best process L2 input. Research shows that feedback that proposes new strategies to try is the most fruitful to older adults because older adults tend not to try new strategies on their own (Peterson, 1983). Thus, this type of instruction would help them move to useful strategies instead of relying on old strategies like rote memorization of grammar rules, which are not likely to be effective for them. Moreover, trial-and-error learning, as is often the case with practice-driven learning, seems to be especially productive for older adults as compared to younger adults (Cyr & Anderson, 2011). TBLT also emphasizes language use over language rules and facilitates independent learning so that students discover the language at their pace. At the same time, classroom activities are kept relevant to the real world and thus to older adult learners, allowing them to connect their new knowledge of how to complete the task in the L2 with their rich background of corresponding L1 experiences. Both PI and TBLT are in line with psychology and SLA research on implicit and explicit learning conditions that suggest that older adults may do better with less information to be retained in explicit memory, such as metalinguistic grammatical explanations (e.g., Lenet et al.,

2011; Midford & Kirsner, 2005). De-emphasizing grammar explanations also coincides with educational research that suggests that above all, practitioners must be patient, allowing time for new material to sink in, maximizing the opportunities to practice and recycle previously covered material, and to encourage learners to be active in the classroom, as production aids in retention (Froger, Sacher, Gaudouen, Isingrini, & Taconnat, 2011). More specifically, this may mean that curricular units for older adults should contain fewer components than they might for younger adults and syllabi should emphasize links between previously existing and new knowledge, to overcome detriments in WMC and processing speed while capitalizing on the amalgamation of background knowledge older adults have accumulated over the years (Kirasic et al., 1996). As a corollary, classroom activities should be self-paced whenever possible, since time pressure greatly diminishes older adults' performance (Peterson, 1983). These considerations do not, however, require that older adults have separate syllabi and sections from younger adults, as all of the above considerations would promote learning for students of all ages.

On a smaller scale, both textbook writers and teachers need to consider the changing audience of university classes when developing materials. For example, older adults are likely to not feel included in activities that relate to girl/boyfriends, since they may have moved beyond that stage of life, or that involve their mother or father's opinions, since their parents may no longer be living (Andrew, 2012). On the other hand, topics that do pertain to older adults' lives, such as their children and grandchildren, may not be relevant to younger adult students. Therefore, materials developers should aim to include some instances of each, to avoid alienating either age group, and to develop flexible activities that allow the learner to choose which family member's opinions they want to work with (e.g., mother or daughter). Whenever possible, materials for older adults should consist of simultaneous audiovisual presentation, to minimize the effects of detriment of either vision or hearing, and activities should address real-world situations (Joiner, 1981). Since older adults are less likely to take risks, they may require special instruction and motivation to utilize strategies such as guessing at the meaning of unknown words that are more intuitive to less inhibited younger adults (Joiner, 1981). Again, this encouragement would not be detrimental to younger adults in the same classroom and may in fact increase their learning as well.

While it may seem obvious, it also bears mentioning that the physical changes due to cognitive aging also need to be considered when designing an environment that includes older adult learners. Classrooms need good lighting and should have as little background noise as possible. Written materials should be in large print. The instructor should have a relatively loud voice and should always make his or her face visible to learners while speaking (Peterson, 1983).

To finish, note that these are suggestions, but as with any demographic group, older adults vary widely in needs and wants according to socioeconomic status, physical health conditions, and personal interests. Moreover, older adults are likely to have specific reasons or goals for enrolling in a foreign language class, and their developed self-awareness makes it easy for them to communicate these reasons, which may not always be true of younger adult learners. Thus, it is always good practice to begin with a needs assessment on the first day of class, allowing

the students themselves to communicate to each other and to the teacher what it is that they are looking for instead of relying on preconceptions of what language learning in later life should be (Findsen, 2005). This would also help the instructor to decide how to incorporate the needs and desires of both younger and older adults in their classroom.

Future Directions for Research

While the studies reviewed above show some implications for language-learning classrooms including the older adult population, clearly more research is needed in SLA to understand how findings from education and cognitive psychology research apply to non-primary language learning, so that we can extend our understanding of language and cognition in the aging mind, as well as to develop intergenerational language programs needed to satisfy demand for integrated learning opportunities for older adults (American Council of Education, 2008). Such research programs should include further investigations of the effects of instructional conditions, since that avenue of research is informative to both cognitive psychology and SLA. Laboratory studies are "unique experiences" (Peterson, 1983, p. 75) for most people; that is, they are not precisely the same as real-life learning situations, and thus are not entirely representative of classroom learning experiences. Nevertheless, they are still necessary steps for ensuring that critical factors such as amount and type of practice are controlled for in research designs. At the same time, these studies need to have larger sample sizes to better approximate the variation that exists in the greater population of older adult learners. Finally, both laboratory and classroom studies need to incorporate the voice of the population they are studying into research questions, design, and the dissemination of results (Ortega, 2005), for example by interviewing older adults to identify issues that warrant investigation and relaying findings back to participants. In this way, older adults can maximize the advantages of being independent learners by increasing their awareness of how they learn best, and applying that knowledge in the classroom and in private study. Consequently, we as researchers and educators can also avoid the pitfall pointed out by Cruikshank (2003) of imposing a certain structure on older adults instead of letting them tell us what it is they want and need.

Conclusion

This chapter has reviewed research on older adults' learning from education, cognitive psychology, and SLA to apply findings to foreign language classrooms. These studies show that older adults are capable of learning, and that learning is rewarding for them, but also that learning in older adults is affected by the process of normal aging. Two methodologies in particular seem to be of note for teachers of older adults: PI and TBLT. While both of these methodologies are already often employed in classrooms for young adults, there are additional considerations that need be taken into account for older adults, such as their reduced declarative learning and memory capabilities, but relatively well-maintained procedural learning and memory. In addition, other cognitive and

physical considerations, such as reduced WMC, vision, and hearing, need to be accounted for in the classroom. Finally, older adults should be made to feel included in classroom activities and textbook readings, instead of having materials designed solely for younger students. By following these suggestions, and incorporating new findings from all three fields as they develop, it should be possible to create language programs that both play to older adults' strengths and mitigate the effects of their weaknesses, whether they are directed specifically at older adults or for intergenerational learning. This is crucial for meeting the demand for such classes that currently exist (and will continue to grow in the future) (e.g., American Council of Education, 2008; Toossi, 2012), as well as to provide a service to older adults to maintain their cognitive abilities throughout the aging process (Dell'Amore, 2011; Ostwald & Williams, 1985). Finally, developing successful language learning classes for older adults can help to reverse negative stereotypes regarding aging in society and in L2 classrooms, as the complex task of language learning builds individuals' self-confidence and opens them to new experiences.

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