PSYCHOLOGIA ROZWOJOWA, 2017 ∗ tom 22, nr 2, s. 45–53
doi:10.4467/20843879PR.17.009.7041
www.ejournals.eu/Psychologia-Rozwojowa

KAROLINA BYCZEWSKA-KONIECZNY

Instytut Psychologii, Uniwersytet Jagielloński, Kraków
Institute of Psychology, Jagiellonian University, Cracow
e-mail: k.byczewska@gmail.com

MARIA KIELAR-TURSKA

Instytut Psychologii, Akademia Ignatianum, Kraków
Institute of Psychology, Jesuit University Ignatianum, Cracow
e-mail: maria.kielar-turska@uj.edu.pl

Syntactic Abilities in Old Age and Their Relation to Working Memory and Cognitive Flexibility[1]

Abstract. The aim of the study was to describe the syntactic abilities of elderly people taking into account possible differences between young-olds (67–75; M = 72.55, SD = 1.99) and old-olds (76–90; M = 79.88, SD = 2.92) in this area. Spontaneously produced narrations were assessed taking into account the grammatical correctness, complexity and coherence. Working memory and cognitive flexibility (visual shifting and verbal fluency) were also measured. The analysis showed that the young-olds differ from the old-olds only in the coherence of their narrations. The relation between using anaphors and working memory capacity was also proved.

Keywords: aging, syntactic abilities, working memory, cognitive flexibility.

INTRODUCTION

The syntactic abilities are required to build statements in accordance with the rules of a particular language. They include abilities to produce grammatically correct word associations, build complex syntactic constructions and produce coherent statements. Syntactic processing changes during the life-span. The significant progress of grammaticalisation is observed in early and middle childhood (Sigelman, Rider, 2011). Children learn the basics of a grammatical system during the first three years of life (Kielar-Turska, 2006). Then the ability to use coordinate and subordinate sentences correctly improves (Przetacznikowa, 1967). During late childhood, the competencies to produce complex statements in the first language become similar to the competencies of adults (Kurcz, 2005).

In late adulthood changes in this area become again noticeable but they have a rather regressive character. Elderly people, in comparison with younger adults, make more linguistic mistakes (Kemper, Herman, Liu, 2004). The most frequent ones are omissions of pronouns and particles (Kynette, Kemper, 1986). Elderly adults more often than young people create incorrect word associations (Kynette, Kemper, 1986). The decrease of the complexity of statements in this age is seen in the reduction of the proportion of double- (or multi-) complex sentences to simple ones (Kemper, 1987; Kemper, Greiner, Marquis, Prenovost, Mitzner, 2001). In late adulthood the diversity of syntactic structures also declines (Kynette, Kemper, 1986). What is more, old adults need significantly more time than younger people to build complex statements (Davidson, Zacks, Ferreira, 2003; Kemper, Herman, Lian, 2003). In old age we can also observe

a decrease in the coherence of statements. Elderly people, in comparison with the younger population, less frequently produce sentences that introduce other sentences (Kemper, 1992). They also more often construct incorrect anaphors (Kemper, 1987).

Explaining the regressive changes in the area of syntactic processing in old age, psychologists emphasise the role of a general age-related cognitive decline (Wingfield, Stine-Morrow, 2000). In this context, the role of executive functions is emphasized.

First of all, the role of working memory is indicated. In experimental studies (Kemper et al., 2003; Davidson et al., 2003) young (~20 years old) and old (~75 years old) people were compared in tasks requiring composing sentences from given words. In different conditions the participants were presented with cue words varying in the number of potential syntactic options they allowed. When there was only one option, no age differences were observed. But under more difficult conditions (2, 3 or 4 syntactic structures that could be formed with a given word), the latency of sentence construction and difficulties in sentence formulation was different between the age groups, indicating that elderly people are less efficient in such tasks. The authors explained such a phenomenon by referring to an age-related decline in the capacity of working memory. They emphasized that to solve tasks with an increasing complexity of a cue word, a high memory load and a good ability to operate information is needed. Marcel A. Just and Patricia A. Carpenter (1992) interpret the age-related decline in integrating information across sentences in the context of a capacity theory of comprehension. They indicate that making inference is demanding for working memory, because it requires storing information from a previous sentence while producing another one.

The second important correlate of the age-related decline in syntactic processing is another component of executive functions, i.e. cognitive flexibility. The role of the ability to switch between different attitudes (e.g. to stop thinking about one concept and start thinking about another one) is less frequently mentioned in literature concerning age-related changes in syntactic processing. It is most often considered in the context of off-target verbosity. This phenomenon refers to the tendency of elderly people to build narrations of little consistency (because of e.g. making many digressions, using few anaphors, building complex statements without correct conjunctions) (Kielar-Turska, Byczewska-Konieczny, 2014). Julie D. Henry, William von Hippel and Kate Baynes (2009) analyzed statements produced by elderly people to assess their appropriateness in the social context. The factors that they took into account included redundancy and the arrangement of arguments. They observed that elderly people whose statements were poorly organized got lower results in a test measuring cognitive flexibility. Also Tannis Y. Arbuckle, Michiko Nohara-LeClair and Dolores Pushkar (2000) observed that in old age the intensity of off--target verbosity is correlated with the level of inhibitory deficits.

Assuming the role of working memory and cognitive flexibility in the age-related syntactic decline, it is worth mentioning that the elderly population is diverse as regards this dimension of cognitive performance. One of important factor that should be indicated in this context is age. In studies considering the role of executive functions in the syntactic abilities of elderly people researchers have focused on comparing young (~20–30-year-olds) and old adults (≥65-year-olds). However, it was proved, that 'young-olds' and 'old-olds' perform differently in tests measuring executive functions. For example, Trevor W. Robbins, Merle James, Adrian M. Owen, Barbara J. Sahakian, Andrew D. Lawrence, Lynn McInnes and Patrick M. A. Rabbitt (1998) analyzed the results of spatial working memory and attentional shifting tests, obtained from people aged 55–80. They divided the participants into subgroups representing every five years of life. They observed that the performance in working memory tests systematically decreased with age and for cognitive flexibility the most visible difference was between the participants aged ≥75 and those aged 65–70. The difference between young-olds and old-olds in working memory capacity was pro-

ved also by Rossana De Beni, Erika Borella and Barbara Carretti (2007). In their study people aged between 65 and 74 got worse results in the Listening Span Test than older participants aged between 75 and 85. Daniela S. Bakos, Maria C.P. de Paula Couto, Wilson V. Melo, Maria A.M.P. Parente, Silvia H. Koller and Lisiane Bizarro (2008) observed that old-olds (mean age = 80 years), in comparison with young-olds (mean age = 62 years), obtained lower scores in the Iowa Gambling Task measuring executive functions. These results suggest that syntactic abilities, which are thought to be related to executive functions, may also be different in young-olds and old-olds.

In the presented study we tried to describe the syntactic abilities of elderly people taking into account possible differences between young-olds and old-olds in this area. We focused on three aspects of syntactic processing: producing grammatically correct word associations, building complex syntactic constructions and producing coherent statements. Traditionally, the syntactic abilities of adults have been measured using different tasks and tests in which participants had to compose sentences from given words or assess the grammatical correctness of sentences. We used another approach, recommended by Susan Kemper (Kemper, Sumner, 2001). To assess the syntactic abilities of elderly people, we analyzed spontaneous speech. We also measured the working memory and cognitive flexibility to confirm their relation to the correctness, complexity and coherence of statements produced by elderly adults.

METHOD

Participants

The sample included 50 elderly people, who volunteered to participate in the study. They were recruited from among the retired citizens of Cracow. There were two groups: 25 young-olds aged between 65 and 75 (M = 72.55, SD = 1.99) and 25 old-olds aged between 76 and 90 (M = 79.88, SD = 2.92). None of the participants reported a neurological or psychiatric disorder. The demographic data of the sample were presented in Table 1.

Table 1. Demographic characteristics of the study group

	Young-olds	**Old-olds**
% of female	91	84
% of participants with a degree	64	64

Procedure

All the participants were tested individually by a trained examiner in two sessions (mean time of the session: 1.5 hours). The sessions took place in a small, quiet room (in the Institute of Psychology at the Jagiellonian University in Cracow). The examiner and a participant sat at a table. During the first session, a neuropsychological diagnosis was conducted. The second session started with an interview. The participants' answers were recorded. After the interview, an assessment of executive functions was made.

Participation in the study was voluntary. The participants were rewarded with small gifts after the second session.

MATERIALS

Neuropsychological diagnosis

A neuropsychological diagnosis was made in order to select participants from a normally aging group and differentiate them from clinical groups – especially from patients with dementia, mild cognitive impairment and depression.

The Mini Mental State Examination (Polish adaptation: Stańczak, 2010) was used to test general cognitive functioning. This test is often used in the screening of dementia. According to the recommendation of Bilikiewicz et al. (1999), the cut-off point was the score of ≥ 27 points. All participants achieved results above this point.

Mild cognitive impairment is often treated as a state between normal and pathological aging (Smith, Rush, 2006) and it is known as a good precursor of dementia. According to Talarowska et al. (2011), the Mini Mental State Examination is not sensitive enough to diagnose an elderly patient with mild cognitive impairment. That is why we decided to include another method into the diagnosis, described as useful for differentiating between normal aging and mild cognitive impairment (Greenway et al., 2006). Memory was evaluated using the California Verbal Learning Test (Polish adaptation: Łojek, Stańczak, 2010). The participants were asked to solve all tasks from this test, even though for the purpose of this study we assessed only the results of the first task (memorising a list of 16 words). The results were converted to a standard ten scale. All participants obtained the results of ≥ 5 points on the standard ten scale.

To exclude the subjects with clinical or sub-clinical symptoms of depression, the Beck Depression Inventory was used (Beck, Steer, Brown, 1996). The cut-off point was the score of ≤ 10 points. All participants achieved results below this point.

Syntactic abilities

The syntactic abilities of the participants were evaluated taking into account three variables: the coherence, complexity, and grammatical correctness of sentences. The participants were asked four questions: (1) *What do you usually do during a weekday?*, (2) *How do you usually spend your holidays?*, (3) *What are your interests?*, and (4) *What are your plans for the future?* Those questions were selected so as to provoke the participants to construct longer oral speech samples. Interviews were recorded and then transcribed. The formal aspect of the produced statements was analysed. Indicators of syntactic abilities were determined with respect to the rules of the Polish language (see Table 2).

Table 2. Indicators of syntactic abilities

Aspect of syntactic abilities	Indicators
Coherence of the statement	$\frac{\text{number of complement anaphors}}{\text{number of all sentences}}$
	$\frac{\text{number of complement anaphors}}{\text{number of all sentences}}$
Complexity of the statement	$\frac{\text{number of non – verb forms}}{\text{number of all forms}}$
	$\frac{\text{number of complex sentences}}{\text{number of all sentences}}$
	$\frac{\text{number of multiple complex sentences}}{\text{number of all complex sentences}}$
Correctness of the statement	$\frac{\text{number of incorrect word associations}}{\text{number of all words}}$

Executive functions

The WAIS-R Digit Span Subtest was used to asses working memory. For both straight and backward recall the experimenter started with numerical strings consisting of three digits. Successively, there appeared more elements in the strings (up to nine). The task was continued until the person failed twice with strings consisting of the same number of elements. The sum of correct backward digit recalls was the indicator of this aspect of executive functions.

Two aspects of cognitive flexibility were taken into account: visual switching and verbal fluency. Visual switching was measured by the Trial Making Test from the Halstead-Reitan battery (Strauss, Sherman, Spreen, 2006). The participants completed both parts of this test: part A, in which the targets are all numbers and should be connected in a sequential order, and part B, in which the participant alternates between numbers and letters. The time of completing part B was treated as an indicator of cognitive flexibility. Verbal fluency was assessed in two aspects: semantic and phonemic (Piskunowicz, Bieliński, Zgliński, Borkowska, 2013). For both conditions, the participants had one minute to produce as many exemplars as possible. In the semantic variant of the task, the participants had to give names of animals and in the phonemic one – words that start with *K*. The sum of all words produced in the semantic and phonemic variant was an indicator of verbal fluency.

RESULTS

The results of the screening were presented in Table 3. There were no significant differences between the young-olds and old-olds in any test.

Table 4 contains descriptive statistics for all variables.

Table 3. Results of the screening

	Young-olds	**Old-olds**	***t* (p)**	**Cohen's *d***
	M (SD)	**M (SD)**		
Mini Mental State Examination	28.50 (1.54)	28.45 (1.51)	.09 (.34)	.03
California Verbal Learning Test	7.25 (1.58)	7.08 (1.49)	.25 (.80)	.11
Beck Depression Inventory	10.86 (7.55)	10.40 (7.46)	.16 (.88)	.06

Table 4. Descriptive statistics for all variables

	Young-olds			**Old-olds**		
	Range	**M**	**SD**	**Range**	**M**	**SD**
Syntactic abilities						
Coherence 1	.02–.49	.23	.12	.08–.52	.22	.10
Coherence 2	.70–3.50	1.45	.59	.95–7.00	1.90	1.15
Complexity 1	.04–.27	.12	.06	.03–.27	.12	.06
Complexity 2	.45–.76	.54	.08	.36–.89	.54	.12
Complexity 3	.25–.85	.53	.14	.24–.72	.49	.11
Correctness 1	.00–.01	.003	.003	.00–.02	.003	.003
Working memory	2–7	3.94	1.34	2–6	3.43	1.39
Visual switching	43–174	95.56	34.73	8–165	129.85	24.82
Verbal fluency	26–61	37.73	9.76	20–43	31.88	1.11

To see the relation between different aspects of syntactic abilities and executive functions in elderly people, we conducted a correlation analysis. The results were presented in Table 5.

Table 5. Pearson correlation coefficients for different aspects of syntactic abilities and executive functions (an analysis conducted on the results obtained by participants from both age groups)

Syntactic abilities	Working memory	Visual switching	Verbal fluency
Coherence 1	.59*	.15	−.06
Coherence 2	−.10	.26	−.28
Complexity 1	−.27	.17	.03
Complexity 2	.02	−.01	−.12
Complexity 3	−.03	.01	−.06
Correctness 1	−.05	.00	.17

*$p < .05$

T-tests were conducted to see if there were differences between the young-olds and old--olds in any aspect of their syntactic abilities. For the first indicator of coherence, i.e. the ability to use complement anaphors, the results were not statistically significant: $t = -.35$, $p = .38$, Cohen's $d = .09$ (Levene's $F(1.45) = 1.22$, $p = .27$). For the second aspect of coherence, i.e. the proportion of using subordinate and coordinate conjunctions, the results were as follows: $t = 1.69$, $p = .003$, Cohen's $d = .50$ (Levene's $F(1.45) = .70$, $p = .41$). The difference was statistically significant, with a higher proportion in the group of old-olds and a medium size effect. There was no difference between the groups in the frequency of using non-verb forms (the first indicator of the complexity of statements): $t = .20$, $p = .76$, Cohen's $d = -.07$ (Levene's $F(1.45) = .27$, $p = .61$). For the second aspect of complexity, i.e. the proportion of complex sentences to all sentences uttered by a participant, the results were as follows: $t = .002$, $p = .10$, Cohen's $d = .00$ (Levene's $F(1.45) = 2.20$, $p = .15$). In reference to the construction of multiple complex sentences, there were no statistically significant differences either: $t = -.99$, $p = .18$, Cohen's $d = .24$ (Levene's $F(1.45) = .87$, $p = .35$). For the last aspect of syntactic abilities, the correctness of statements, the following results were obtained: $t = .15$, $p = .23$, Cohen's $d = .00$ (Levene's $F(1.45) = .58$, $p = .45$).

A comparison of the young-olds and old--olds in their results in measuring executive functions showed that the younger group did significantly better only in the Trial Making Tests: $t = 2.35$, $p = .03$, Cohen's $d = -1.13$ (Levene's $F(1.45) = .78$, $p = .39$). For verbal fluency ($t = -1.41$, $p = .17$, Cohen's $d = .00$ (Levene's $F(1.45) = .58$, $p = .45$)) and working memory ($t = -.83$, $p = .42$, Cohen's $d = .58$ (Levene's $F(1.45) = .00$, $p = .99$)) there were no statistically significant differences between the young-olds and old-olds.

DISCUSSION

In this article, we tried to describe the syntactic abilities of elderly people. It was previously observed that an age-related cognitive decline affects the area of syntactic processing, and elderly people, in comparison with the younger population, have more problems with constructing coherent, complex and grammatically correct statements (Davidson et al., 2003; Kemper, 1987; Kynette, Kemper, 1986). Taking into account the results of previous researches, we hypothesized that the cognitive mechanism of the age-related decline in the area of syntactic processing is related to executive functions. We considered the role of two of their components: working memory and cognitive flexibility (Davidson et al., 2003; Henry et al., 2009). It was observed that in the

field of executive functions the most dynamic age-related changes appear after 75 years of age (De Beni et al., 2007; Robbins et al., 1998). In reference to this finding we decided to check if there are differences between young-olds and old-olds as concerns their syntactic abilities.

First of all, we did not observe relations between the syntactic abilities of elderly people and their performance in tasks measuring working memory and cognitive flexibility. Almost all correlations were statistically insignificant and represented low effect sizes. The only exception was the relation between working memory and the coherence of statements produced by elderly people. Those who used more complement anaphors (in proportion to all sentences) in spontaneous speech got better results in the Digit Span task. This result is consistent with previous findings referring to the younger population. Judith Streb, Frank Rösler and Erwin Henninghausen (1999) observed that using anaphors evoked activation in prefrontal and parietal cortex, which was interpreted by the authors as a proof of the role of working memory in this process. The relation between working memory and recognizing anaphoric dependencies was also observed by Ian Cunnings and Claudia Felser (2013).

However, the lack of significant relations between other syntactic abilities and executive functions needs to be discussed because it is inconsistent with our expectations. A possible explanation refers to the method that we used to assess the syntactic abilities of the participants. We analysed spontaneous speech and there was no time limit for the construction of statements. Other studies (e.g. Just, Carpenter, 1992; Davidson et al., 2003) used rather experimental methods. In these studies the indicator taken into account in assessing the syntactic abilities of elderly people was usually production latency, which was correlated with working memory and cognitive flexibility. The role of executive functions in the syntactic processing of elderly people may be smaller when taking into account the quality of their statements constructed in conditions without time limits. In further research other cognitive abilities should be taken into account. A potential candidate is long-term memory. It was observed in the younger population that better long-term memory is related to the ability to infer about the content of a text on the basis of the conjunctions between the sentences (McKoon, Ratcliff, 1980).

The results of a comparison between the young-olds and old-olds in the area of executive functions are also inconsistent with our expectations. The only difference appeared for visual switching. The younger group was significantly better than the older one in the Trial Making Tests, although for working memory Cohen's *d* represented a medium effect size. No statistically significant differences were proved for verbal fluency. These results suggest that age-related changes in verbal and non-verbal aspects of cognitive flexibility are disharmonious. Aging affects the non-verbal sphere more. It is consistent with the results of studies on hemispheric asymmetry in the general cognitive functioning of elderly people (e.g. Krzymiński, 1993; Royall, Palmer, Chiodo, Polk, 2005), which suggests that non-verbal abilities are more affected by age than verbal functions.

Because age group differences were observed only for visual switching and this aspect of executive functions was not correlated with syntactic processing, there should be no differences between the young-olds and old-olds in any aspect of their syntactic abilities. However, the analysis showed that the proportion of using subordinate and coordinate conjunctions was higher in the group of old-olds. This was the only statistically significant difference. Again, this result was inconsistent with our expectations: we supposed that the tendency would be reversed and the young-olds would use more conjunctions between sentences. One possible explanation of this finding refers to off-target verbosity. This phenomenon is identified e.g. when people have a tendency to build complex statements without correct conjunctions (Pushkar, Basevitz, Arbuckle, Nohara-LeClair, Lapidus, Peled, 2000). It is more prevalent in old age, in comparison with the younger population. Our result could be interpreted in the context of off-target verbosity. Maybe the old-olds used conjunctions more often but the complex sentences they constructed were not thematically

consistent. The lack of age differences in the usage of anaphors proves, to some extent, this hypothesis. However, it needs further verification with not only formal analysis of narrations but also taking into account their content.

There are also some limitations to the study we conducted. First of all, our sample consisted mainly of women with higher education. Both variables, i.e. the sex and level of education, are factors that are related to cognitive functioning in old age (Depp, Jeste, 2006), so the sample is not representative for all population of elderly people. Secondly, we decided to assess syntactic abilities on the basis of spontaneous speech. The idea was to increase the ecological validity of the study. However, such a procedure displays less controlled conditions. We also decided to focus on the formal aspect of the narrations produced by the participants. An analysis of their content would bring additional information that could be useful for the better understanding of the syntactic abilities of elderly people.

NOTE

[1] This work was supported by the Polish National Science Centre (grant number 2011/03/N/HS6/02241).

REFERENCES

Arbuckle T.Y., Nohara-LeClair M., Pushkar D. (2000). Effect of off-target verbosity on communication efficiency in a referential communication task. *Psychology and Aging*, 15(1), 65–77.

Bakos D.S., de Paula Couto M.C.P., Melo W.V., Parente M.A.M.P., Koller S.H., Bizarro L. (2008). Executive functions in the young elderly and oldest old: A preliminary comparison emphasizing decision making. *Psychology & Neuroscience*, 1(2), 183.

Beck A.T., Steer R.A., Brown G.K. (1996). *Manual for the Beck Depression Inventory–II.* San Antonio, TX: Psychological Corporation.

Bilikiewicz A., Barcikowska M., Kądzielawa D., Kotapka-Minc S., Leszek J., Mossakowski M., Opala, G., Parnowski T., Pfeffer A., Szczudlik A., Żakowska-Wachelko B. (1999). Stanowisko grupy ekspertów w sprawie zasad diagnozowania i leczenia otępienia w Polsce (IGERO). *Rocznik Psychogeriatryczny*, 1, 105–152.

Carretti B., Borella E., De Beni R. (2007). Does strategic memory training improve the working memory performance of younger and older adults? *Experimental Psychology*, 54(4), 311–320.

Cunnings I., Felser C. (2013). The role of working memory in the processing of reflexives. *Language and Cognitive Processes*, 28(1–2), 188–219.

Davidson D.J., Zacks R.T., Ferreira F. (2003). Age preservation of the syntactic processor in production. *Journal of Psycholinguistic Research*, 32(5), 541–566.

Depp C.A., Jeste D.V. (2006). Definitions and predictors of successful aging: A comprehensive review of larger quantitative study. *American Journal of Geriatric Psychiatry*, 14(1), 6–20.

Greenaway M.C., Lacritz L.H., Binegar D., Weiner M.F., Lipton A., Munro Cullum C. (2006). Patterns of verbal memory performance in mild cognitive impairment, Alzheimer disease, and normal aging. *Cognitive and Behavioral Neurology*, 19(2), 79–84.

Henry J.D., von Hippel W., Baynes K. (2009). Social inappropriateness, executive control, and aging. *Psychology and aging*, 24(1), 239–244.

Just M.A., Carpenter P.A. (1992). A capacity theory of comprehension: individual differences in working memory. *Psychological review*, 99(1), 122–149.

Kemper S. (1987). Life-span changes in syntactic complexity. *Journal of Gerontology*, 42(3), 323–328.

Kemper S. (1992). Adults' sentence fragments: Who, what, when, where, and why. *Communication Research*, 19(4), 444–458.

Kemper S., Sumner A. (2001). The structure of verbal abilities in young and older adults. *Psychology and aging*, 16(2), 312–322.

Kemper S., Greiner L.H., Marquis J.G., Prenovost K., Mitzner T.L. (2001). Language Decline Across the Life Span: Findings From the Nun Study. *Psychology and Aging*, 16(2), 227–239.

Kemper S., Herman R.E., Lian C.H.T. (2003). The Costs of Doing Two Things at Once for Young and Older Adults: Talking while Walking, Finger Tapping, and Ignoring Speech or Noise. *Psychology and Aging*, 18(2), 181–192.

Kemper S., Herman R.E., Liu C.J. (2004). Sentence production by young and older adults in controlled contexts. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 59(5), 220–224.

Kielar-Turska M., Byczewska-Konieczny K. (2014). Specyficzne właściwości posługiwania się językiem przez osoby w wieku senioralnym. In S. Milewski, J. Kuczkowski, K. Kaczorowska-Bray (Eds.), *Biomedyczne podstawy logopedii* (pp. 429–443). Gdańsk: Harmonia Universalis.

Kielar-Turska M. (2006). Rozwój mowy. In T. Pilch (Ed.) *Encyklopiedia pedagogiczna XXI wieku* (Vol. 5) (pp. 498–509). Warszawa: Wydawnictwo Żak.

Krzymiński S. (1993). Geriatria i psychogeriatria. Zagadnienia ogólne. In S. Krzymiński (Ed.), *Zaburzenia psychiczne wieku podeszłego* (pp. 9–33). Warszawa: PZWL.

Kurcz I. (2005). *Psychologia języka i komunikacji.* Warszawa: Wydawnictwo Naukowe Scholar.

Kynette D., Kemper S. (1986). Aging and the loss of grammatical forms: A cross-sectional study of language performance. *Language and Communication*, 6, 65–72.

Łojek E., Stańczak J. (2010). *Podręcznik do Kalifornijskiego Testu Uczenia się Językowego CVLT. Polska normalizacja.* Pracownia Testów Psychologicznych Polskiego Towarzystwa Psychologicznego.

McKoon G., Ratcliff R. (1980). The comprehension processes and memory structures involved in anaphoric reference. *Journal of Verbal Learning and Verbal Behavior*, 19(6), 668–682.

Piskunowicz M., Bieliński M., Zgliński A., Borkowska A. (2013). Testy fluencji słownej – zastosowanie w diagnostyce neuropsychologicznej. *Psychiatria Polska*, 47(3), 475–485.

Przetacznikowa M. (1967). *Rozwój psychiczny dzieci i młodzieży*. Warszawa: PZWS.

Pushkar D., Basevitz P., Arbuckle T., Nohara-LeClair M., Lapidus, S., Peled, M. (2000). Social behavior and off-target verbosity in elderly people. *Psychology and Aging*, 15(2), 361–374.

Robbins T.W., James M., Owen A.M., Sahakian B.J., Lawrence A.D., McInnes L., Rabbitt P.M. (1998). A study of performance on tests from the CANTAB battery sensitive to frontal lobe dysfunction in a large sample of normal volunteers: Implications for theories of executive functioning and cognitive aging. *Journal of the International Neuropsychological Society*, 4(05), 474–490.

Royall D.R., Palmer R., Chiodo L.K., Polk M.J. (2005). Normal rates of cognitive change in successful aging: The Freedom House study. *Journal of the International Neuropsychological Society*, 11(07), 899–909.

Sigelman C.K., Rider E.A. (2011). *Life-Span Human Development* (7th ed.) (pp. 147–164). Wadsworth Cengage Learning.

Stańczak J. (2010). *MINIMENTAL – Krótka Skala Oceny Stanu Umysłowego (MMSE)*. Warszawa: Pracownia Testów Psychologicznych Polskiego Towarzystwa Psychologicznego.

Strauss E., Sherman E.M., Spreen O. (2006). A *compendium of neuropsychological tests: Administration, norms, and commentary*. New York: Oxford University Press.

Streb J., Rösler F., Hennighausen E. (1999). Event-related responses to pronoun and proper name anaphors in parallel and nonparallel discourse structures. *Brain and Language*, 70(2), 273–286.

Talarowska M., Florkowski A., Zboralski K., Gałecki P. (2011). Skala MOCA oraz MMSE w diagnozie łagodnych zaburzeń funkcji poznawczych. MOCA and MMSE in the diagnosis of Mild Cognitive Impairment. *Psychiatria i Psychoterapia*, 7(1), 13–20.

Wingfield A., Stine-Morrow E.A.L. (2000). Language and speech. In F.I.M. Craik, T.A. Salthouse (Eds.), *The Handbook of Aging and Cognition* (2nd ed.) (pp. 349–416). Mahwah: Erlbaum.