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RESEARCH ARTICLE

# Writing Tasks and Immediate Auditory Memory in Peruvian Schoolchildren

## Tareas de escritura y memoria auditiva inmediata en escolares Peruanos

**José Luís Ventura-León & Tomás Caycho***

Universidad Privada del Norte, Lima, Perú.

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***Corresponding author**

**Email:** tomas.caycho@upn.pe

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**Summary**

The purpose of the study is determine the relationship between a group of writing tasks and the immediate auditory memory, as well as to establish differences according to sex and level of study. Two hundred and three schoolchildren of fifth and sixth of elementary education from Lima (Peru) participated, they were selected by a non-probabilistic sample. The Immediate Auditory Memory Test and the Battery for Evaluation of Writing Processes (known in Spanish as PROESC) were used. Central tendency measures were used for descriptive analysis. We employed the Mann-Whitney U test, Spearman Rho test and probability of superiority as effect size measurement for the inferential analysis. The results indicated a moderate direct and significant correlation between writing tasks and immediate auditory memory in general way and low correlations between dimensions. Finally, it showed that the differences in immediate auditory memory and writing tasks according to sex and level of study does not have practical significance.

**Keywords:** schoolchildren, Peruvians, immediate auditory memory, writing processes.

**Resumen**

El objetivo del estudio es determinar la relación entre un conjunto de tareas de escritura y la memoria auditiva inmediata, así como establecer diferencias en función al sexo y el grado de estudios. Participaron 203 escolares de quinto y sexto grado de educación de primaria de Lima (Perú), seleccionados mediante un muestreo no probabilístico. Se utilizaron el Test de Memoria Auditiva Inmediata y la Batería de Evaluación de los Procesos de Escritura (PROESC). Para el análisis descriptivo se utilizaron medidas de tendencia central. Para el análisis inferencial se emplearon la U de Mann-Whitney, Rho de Spearman y la probabilidad de superioridad como medida del tamaño del efecto. Los resultados indicaron una correlación moderada, directa y significativa entre las tareas de escritura y la memoria auditiva inmediata en forma general y correlaciones bajas entre las dimensiones. Finalmente, se

evidenció que las diferencias en memoria auditiva inmediata y las tareas de escritura en función del sexo y el grado de estudios no tienen significancia práctica.

**Palabras clave:** Escolares, peruanos, memoria auditiva inmediata, procesos escritos

## Introduction

In the last years, from the educational area, emphasis is being given to achievement of communicative competences of students in different contexts (social, academic, family, etc.) and according to different social needs (Peruvian Ministry of Education [MINEDU], 2016). In this context, currently the textual communicative approach places the understanding and production of text as fundamental processes of communication (Casany, Luna & Sanz, 2007; Lerner, 2008). Thus, writing becomes useful for personal development, the achievement of success in various areas of life (school, community, job, etc.) and insertion in society (MINEDU, 2016).

In Peruvian case, different national and international surveys demonstrate serious problems in reading and writing performance of elementary school students (Canales, Velarde, Meléndez & Lingán, 2013). The Sixth Grade Writing Assessment Report-2013 (MINEDU, 2016) notes that 13.5% of students evaluated achieved the production of a narrative text according to what was expected for their grade, 64.9% are in the process of achieving this; while 21.9% present serious difficulties for the production of coherent narrative texts. These results agree with those who point out that Peruvian children have a better performance for the writing of simple descriptive texts than for narrative texts (Canales, et al., 2013). The results of MINEDU (2016) show how important is to inquire about the state of writing in schoolchildren and the underlying processes, particularly in a country where the population of children from 0 to 11 years old represents about 22% of the total population (National Institute of Statistics and Informatics [INEI], 2016).

Writing is complex, different from reading, various psychological processes intervene since automatic to very elaborate actions (Alvarez, 2003; Cuetos, 2013), and writing is considered as one of the most important skills for learning. According to Cuetos, Ramos & Ruano (2002), there are four processes in writing: 1) message planning, which consists of the preparation of the actions to compose a text from the recovery and organization of the information from the long-term memory (LTM) (Canales et al., 2013; Gallego


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& Rodríguez, 2015; Hayes & Grawdol-Nash, 1996); 2) syntactic processes, which refer to the construction of grammatical structures (Cuetos, 2013); 3) lexical processes, destined to the choice of the word, which require a search in memory to select the one that best suits what you want to express (Cayhualla & Mendoza, 2012); 4) motor processes, that refer to the transformation of the linguistic message into coordinated patterns of movements by hand (Olive, 2004).

If writing is understood as a process involving the deployment of a series of mental operations, such as planning, writing, reviewing (Caldera, 2003; Flower & Hayes, 1980), which can be global, flexible and interactive, and which are related to various cognitive processes (Defior, 1996;), then it is possible to sustain the existence of a relationship between writing and memory (Kellogg, 2001; Nathan & Abermathy, 2012). Studies point out that existence of problems in the planning of a text is related to deficiencies in the registry of information derived from a deterioration of the capacity of verbal memory or with difficulties in retrieving information stored in the LTM (Canales et al., 2013). In the same way, phonological coding processes, generation and structuring of ideas and letter tracing generate cognitive demands on operational memory that affect writing performance (Sánchez, 2009; Sánchez, Moyano & Borzone, 2011).

Other research points out that operational memory of the verbal type is related to the number of written words and phrases (Swanson & Berninger, 1996) and to complexity of the written text (Hoskyn & Swanson, 2003). Thus, it also mentions that verbal operant memory is the variable that best predicts writing for its implication in high level skills such as vocabulary, punctuation, grammatical structure (Vanderberg & Swanson, 2007) and phonological representation during writing (Kellogg, Olive & Piolat, 2007). Experimental studies report the influence of memory on the localization of the word, indicating that the production of text requires the representation of the word (Le Bigot, Passerault & Olive, 2009); moreover, the variation in the accuracy of a text is explained by the variation of operant memory (Martin,

2010). Finally, these found that between phonological operant memory and writing there is a low correlation in relation to age (Bourke, Davies, Sumner & Green, 2014). However, in the relationship between writing and immediate auditory memory is necessary to consider the participation of a series of intervening variables such as: oral expression (Dyson, 1983), attentional (Nydén, Gillberg, Hjelmquist, & Heiman, 1999), level of reading (Berninger, Cartwright, Yates, Swanson & Abbott, 1994), level of psychomotricity (Pescari & Popescu, 2012) and morphological awareness (Mann, 2000) which are not analyzed in the present study, but they must be considered in future studies.

Although different theoretical models show diverse types of memory, in last years the immediate auditory memory has been the object of study in several investigations (Dioses, Manrique & Segura, 2002), relate it to reading comprehension (Yaringaño, 2009), child's personality (Restrepo, Roca, Sucerquia & Herrera, 2012), comprehensive language (Matalinares, et al., 2007) and learning difficulties in spelling (Dioses, 2003), among others. Immediate auditory memory has been defined as a unit of storage and retrieval of the information obtained through the hearing and that it has three elements: (a) logical memory; (b) numerical memory, (c) associative memory (Cordero, 1978). This concept has a simile with the phonological loop, an operating memory information store, which is responsible for capturing the sounds and codes of hearing (Baddeley, Eysenck & Anderson, 2010); however, there is no proof to measure it in the Peruvian context. Research reports the existence of significant relationships between immediate auditory memory and spelling difficulties (Dioses, 2003). Thus, at the moment of writing a text must perform the auditory analysis of the phonological and acoustic components of the word heard or thought (Canales et al., 2013).

Regarding the difference of writing according to sex, it evidences that 15.7% of women manage to write a narrative text with the characteristics of their grade of study (end of elementary education), while in the case of men just 11.1% manage the same writing (MINEDU, 2016). Similar


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results indicate that women obtained a better average performance than men in writing exercises (Bazán, Castañeda, Macotela & López, 2004). Other studies report that women write longer texts with greater number of subordinate clauses (Kanaris, 1999), they use the accentuation, punctuation, exclamation and interrogation marks better (Dioses, et al., 2014). Results contrary to the previous ones mention that women present a greater average number of misspellings (Dioses, 2003). On the other side, there is much research to point out that exist little evidence to suggest such a difference, this indicates that sex is not the most influential factor for written narration (Jones & Myhill, 2007). Taking into account the difference according to the grade of studies, the limited evidence available indicates that when comparing writing test scores among students from 1st to 6th grade of elementary education in La Plata (Argentina), the higher grade show better and more homogeneous performance (Querejeta, 2012). This same result is observed when comparing Peruvian students of 5th and 6th grade, being the latter who present minor misspellings, although the differences are minimal (Dioses, 2003; Dioses, et al., 2014).

In case of immediate auditory memory, women perform better than men (Dioses, 2003; Feingold, 1993; Matute, Sanz, Gumá; Roselli & Ardila, 2009); regarding the grade of study, the 6th grade students perform better than the 5th grade students (Dioses, 2003).

Based on the theoretical and empirical postulates previously exposed, the present research is of comparative and correlational design (Alarcón, 2008; Salkind, 1999), it aims to determine the relationship between writing tasks and immediate auditory memory in a sample of fifth and sixth grade elementary schoolchildren, as well as to establish if there are differences in these variables according to sex and grade of studies.

This purpose  is justified on the basis of four basic aspects: first, there are few studies about the relationship between writing and memory in the Peruvian context; second, the majority of studies refer to adult population; third, this study will examine whether the relationship between writing and

memory is of the same magnitude or different from previous international studies; and, fourth, at the practical level, the results can be useful for the implementation of writing intervention programs in which the work of different memory strategies is considered as part of the written process.

## Method

### Participant.

The target population consisted of 203 participants of both sexes: 103 women (50.7%) and 100 males (49.3%) elementary school students from three educational institutions in the north of Metropolitan Lima. The ages of students ranged from 9 to 14 years, the average age was 10.72 (DE =.798), selected of non-probabilistic form.

### Instruments.

For the study, two measuring instruments were used: *Battery for Evaluation of Writing Processes* (PROESC, in Spanish) (Cuetos, Ramos & Ruano, 2002), in its Peruvian version (Cayhualla & Mendoza, 2012). The test is composed of six subtests to evaluate the writing: dictation of syllables, composed of thirteen syllables; dictation of words, divided into two list of 21 and 24 words with arbitrary spelling and regulated spelling respectively; dictation of pseudo-words, composed of 16 invented words, which 11 are subject to orthographic rules; dictation of phrases, composed of 6 phrases with eight sentences, two interrogatives and one exclamation (punctuation marks), own names (capital letters), accented words (accents); writing a story, which can be invented or known; writing about a known animal. The reliability of the test was obtained using the internal consistency coefficient Kuder Richardson method (KR =.82); while the evidences of validity were obtained by the criterion of expert judges. Questions are scored with a point if the person is correct or zero if he fails.


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To examine the memory has resorted to the *Immediate Auditory Memory Test (I.A.M.)* (Cordero, 1978), in its Peruvian version (Dioses, Manrique & Segura, 2002) that measures logical, numerical and associative memory from auditory stimuli. The reliability of the test was by the Kuder Richardson coefficient (KR =.795) and evidence of validity was obtained by analyzing the content using expert judges (psychologists and educators). The test measures three factors: (a) logical memory, consists of reading two paragraphs by participants, so that the infant is able to remember the details of the story and then write it in a corresponding space; (b) numerical memory, composed of a series of digits, the child must listen the digits in direct and reverse order and then he had to reproduce them on paper by writing; (c) associative memory, composed of ten pairs of words presented to the child at three different times. First, the pairs of words are read, then one of the words is shown and the child must write the other word.

**Process.**

Prior to the application, it coordinated with educational institutions for their voluntary participation in research. Subsequently, letters of petition were sent to the parents of the children along with the informed consent form for the authorization. At the evaluation date, there were two evaluators per classroom, who were responsible for explaining the purpose of the evaluation and maintain control and care of the material, reading the printed instructions at the top of the tests and solving doubts.

Statistical analysis was performed with program R version 3.1.2 (R Development Core Team, 2007) and was carried out in three stages: firstly, it determined the distribution of data for the selection of relevant statistics; secondly, descriptive statistics were calculated and, finally, the correlation coefficients were estimated, considering the following interpretive categories of Hinkle, Wiersma & Jurs (2003): little or no correlation (Rho ≥ .00, Rho ≥.30), low correlation (Rho ≥ .30, Rho ≥.50), moderate correlation (Rho ≥ .50, Rho ≥.70), high correlation (Rho ≥ .70, Rho ≥.90), very high correlation

(Rho ≥ .90). In the case of probability of superiority, the following criteria were used: no effect, (PSest≤ =.50), small (PSest ≥ .56), medium (PSest ≥ .64) and large (PSest ≥ .71) (Erceg-Hurn & Mirosevich, 2008; Grissom, 1994).

## Results

For the choice of statisticians, it estimated the goodness of fit denominated Kolmogorov-Smirnov for the factors of the PROESC and IAM. The results suggest rejecting the null hypothesis of normality, considering that all factors presented values below .05, thus choosing the use of non-parametric statistics for the comparisons and the correlation measures.

Table 1 allows to observe the average scores and standard deviations of each of the writing tasks and immediate auditory memory, related to the maximum scores that can be obtained in each of them. So, according to writing, dictation of syllables, words with arbitrary spelling, words with regulated spelling, total pseudo-words, pseudo-words with regulated spelling, phrases (capital letters) and story writing showed a performance superior to 50% of their maximum score; while dictation of phrases (accents and punctuation marks) and writing got scored below 50% of their maximum score. Moreover, the greatest dispersion is the dictation of words with arbitrary spelling (SD = 3.635), regulated spelling (SD = 3.610) and dictation of phrases (accents) (SD = 4.676). Similarly, according to immediate auditory memory, the average logical, numerical and associative memory scores are equal to or above 50% of the maximum score of each task; while the highest standard deviations correspond to logical and associative memory, and the lowest correspond to numerical memory.


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**Table 1.**

*Descriptive statistics of PROESC.*

| PROESC tasks | Max. | M | SD |
|---|---|---|---|
| Dictation of syllables | 15 | 10.98 | 2.126 |
| Dictation of words with arbitrary spelling | 21 | 16.76 | 3.635 |
| Dictation of words with regulated spelling | 24 | 19.10 | 3.610 |
| Dictation of total pseudo-words | 16 | 11.14 | 2.351 |
| Dictation of pseudo-words with regulated spelling | 11 | 7.25 | 1.919 |
| Dictation of phrases (accents) | 15 | 6.23 | 4.676 |
| Dictation of phrases (capital letters) | 10 | 8.14 | 2.444 |
| Dictation of phrases (punctuation marks) | 9 | 3.11 | 2.113 |
| Story writing | 10 | 6.17 | 1.624 |
| Writing | 10 | 4.71 | 2.136 |
| TOTAL PROESC | 128 | 93.59 | 17.894 |
| **IAM tasks** | | | |
| Logical Memory | 32 | 17.65 | 7.182 |
| Numerical Memory | 15 | 7,29 | 2.882 |
| Associative Memory | 30 | 24.13 | 6.206 |
| **TOTAL MAI** | 77 | 49.06 | 12.653 |

*Note:* M = Media; SD = Standard deviation; Max. = Maximum. Own elaboration.

In Table 2, it observes that in general form in sixth grade are presented higher average ranges in *writing* ($Ar_{fifth}$ = 94.34; $Ar_{sixth}$ = 109.28). The most striking differences occur in *story writing* ($Ar_{fifth}$ = 96.46; $Ar_{sixth}$ = 107.27), followed by *dictation of words with regulated spelling* ($Ar_{fifth}$ = 96.71; $Ar_{sixth}$ = 107.04) and *dictation of total pseudo-words* ($Ar_{fifth}$ = 96.65; $Ar_{sixth}$ = 107.10). The size of the effect fluctuates between .36 to .45 indicating that there are no practical differences. Furthermore, it shows that girls have higher average ranks ($Ar_{female}$ = 111.99; $Ar_{male}$ = 91.71); the most notable differences occur in *dictation of total pseudo-words* ($Ar_{female}$ = 101.64; $Ar_{male}$ = 102.37), followed by *dictation of pseudo-words with regulated spelling* ($Ar_{female}$ = 101.06; $Ar_{male}$

= 102.97). The size of the effect fluctuates between .32 to .40, values which indicating absence of practical significance.

**Table 2.**

*Average ranges of PROESC factors by school grade and sex.*

| Components | School grader | | | | Sex | | | |
|---|---|---|---|---|---|---|---|---|
| | Ar Fifth (n = 99) | Ar Sixth (n=104) | U | PSest | Ar Female (n = 103) | Ar Male (n=100) | U | PSest |
| Dictation of syllables | 109.74 | 94.63 | 4382.0 | .43 | 111.84 | 91.86 | 4136.0 | .40 |
| Dictation of words with arbitrary spelling | 90.25 | 113.18 | 3985.0 | .39 | 113.59 | 90.06 | 3956.0 | .38 |
| Dictation of words with regulated spelling | 87.80 | 115.51 | 3742.5 | .36 | 117.41 | 86.13 | 3562.5 | .35 |
| Dictation of total pseudo-words | 96.65 | 107.10 | 4618.0 | .45 | 101.64 | 102.37 | 5113.0 | .50 |
| Dictation of pseudo-words with regulated spelling | 96.71 | 107.04 | 4624.0 | .45 | 101.06 | 102.97 | 5053.5 | .49 |
| Dictation of phrases (accents) | 87.49 | 115.81 | 3711.5 | .36 | 119.83 | 83.63 | 3313.0 | .32 |
| Dictation of phrases (capital letters) | 92.00 | 111.52 | 4158.0 | .40 | 116.17 | 87.41 | 3691.0 | .36 |
| Dictation of phrases (punctuation marks) | 95.45 | 108.24 | 4499.5 | .44 | 114.12 | 89.52 | 3901.5 | .38 |
| Story writing | 96.46 | 107.27 | 4599.5 | .45 | 113.66 | 89.99 | 3949.0 | .38 |
| Writing | 90.88 | 112.58 | 4047.5 | .39 | 110.62 | 93.13 | 4262.5 | .41 |
| Media | 94.34 | 109.28 | 4236.75 | .41 | 111.99 | 91.71 | 4093.8 | .40 |

*Note: $PS_{est}$:* probability of superiority (size of effect); Ar: average range; U: Mann-Whitney. Own elaboration.

In Table 3, it shows differences between immediate auditory memory by school grade, the average range are higher in sixth grade ($Ar_{fifth}$ = 90.32; $Ar_{sixth}$ = 113.12). The associative memory factor presents the most striking difference ($Ar_{fifth}$ = 90.15; $Ar_{sixth}$ = 109.48), followed by *logical memory* ($Ar_{fifth}$ = 91.79; $Ar_{sixth}$ = 111.72) and the smallest difference occurs in



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*numerical memory* ($Ar_{fifth}$ = 85.03; $Ar_{sixth}$ = 118.15). On the other hand, the average ranges are reported according to sex and it shows that in general girls present higher values ($Ar_{female}$ = 109.63; $Ar_{male}$ = 94.15), the biggest difference occurs in *numerical memory* ($Ar_{female}$ = 107.83; $Ar_{male}$ = 96.00), followed by *associative memory* ($Ar_{female}$ = 110.44; $Ar_{male}$ = 93.31) and the smallest in *logical memory* ($Ar_{female}$ = 110.61; $Ar_{male}$ = 93.13). The size of the effect shows absence of practical significance for school grade and sex.

**Table 3.**

*Average ranges of IAM components by school grade and sex.*

| | School grade | | | | Sex | | | |
|---|---|---|---|---|---|---|---|---|
| | Ar Fift (n = 99) | Ar Sixth (n=104) | U | PSest | Ar Female (n = 103) | Ar Male (n=100) | U | PSest |
| Logical memory | 91.79 | 111.72 | 4137.0 | .40 | 110.61 | 93.13 | 4263.0 | .41 |
| Numerical memory | 85.03 | 118.15 | 3468.0 | .34 | 107.83 | 96.00 | 4550.0 | .44 |
| Associative memory | 94.15 | 109.48 | 4370.5 | .42 | 110.44 | 93.31 | 4280.5 | .42 |
| Media | 90.32 | 113.12 | 3991.8 | .39 | 109.63 | 94.15 | 4364.5 | .42 |

*Note:* $PS_{est}$: probability of superiority (size of effect); Ar: average range; U: Mann-Whitney. Own elaboration.

Finally, Table 4 reports the Spearman Correlation Coefficient and shows that there is a moderate, direct and significant correlation between variables (Rho = .694, $p$<.001). This indicates that when the scores on the Written Process Battery (PROESC) increase, the Immediate Auditory Memory test (I.A.M) scores also increase. Additionally, this table presents the relationship between each of the components of PROESC and IAM, besides this also evidences that only logical memory presents moderate correlations with writing (Rho=, 599, $p$<.001), dictation of phrases (accents) (Rho =.559, $p$<.001), dictation of words with arbitrary spelling (Rho =,538, $p$<.001) and dictation of words with regulated spelling (Rho =,526, $p$<.001); while the rest of the PROESC variables present a low correlation with numerical and associative memory.

**Table 4.**

*Rho Spearman Coefficients of PROESC and IAM.*

| | Memoria Lógica | Memoria Numérica | Memoria Asociativa | Total MAI |
|---|---|---|---|---|
| Dictado de sílabas | .100 | -.064 | .159* | .110 |
| Dictado de palabras con ortografía arbitraria | .538** | .275** | .313** | .544** |
| Dictado de palabras con ortografía reglada | .526** | .267** | .333** | .542** |
| Dictado de pseudopalabras total | .437** | .214** | .340** | .468** |
| Dictado de pseudopalabras con ortografía reglada | .361** | .159* | .338** | .408** |
| Dictado de frases (acentos) | .559** | .354** | .358** | .590** |
| Dictado de frases (mayúsculas) | .416** | .151* | .331** | .427** |
| Dictado de frases (signos de puntuación) | .436** | .131 | .378** | .460** |
| Escritura de cuento | .212** | .224** | .247** | .277** |
| Escritura de una redacción | .599** | .183** | .306** | .551** |
| TOTAL PROESC | .669** | .321** | .469** | .694** |

**. The correlation is significant at the .01 level (2 sides); *. The correlation is significant at the 0.05 level (2 sides). Own elaboration.

## Discussion

The research is born from the interest to analyze writing and its relation with cognitive variables in Peruvian schoolchildren, according to its indices of difficulty reported by national surveys (MINEDU, 2016) and its importance to the different demands of contemporary society (Querejeta, 2012). In this sense, the objectives of the study were to establish the relationship between different writing tasks and immediate auditory memory in fifth and sixth grade elementary students from three educational institutions in the north of Lima as well as to compare the performance of both variables according to sex and the grade of studies.

In relation to writing tasks, the comparative results point out that women present a better performance than males according to dictation of pseudo-words with regulated spelling and dictation of total pseudo-words, although in both cases there is no practical significance of the results. From


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a neuropsychological perspective, it suggests that the best performance of women compared to men in writing would be related to cognitive differences associated with an anatomical and functional differentiation between the cerebral hemispheres (Gil-Verona et al., 2003). In turn, interhemispheric differentiation would be of a greater and faster rate of physical and cerebral maturation of women (García, 2003). Furthermore, the best performance of women in writing pseudo-words would express the use of the phonological route, that it would allow an adequate phoneme-grapheme conversion and, consequently, a good functioning of the anterior region of the supramarginal rotation of the brain (Dioses, et al., 2014; García, Madrazo & Viñals, 2002; Sánchez, 2006). The absence of a practical significance of results based on sex, measured by the size of the effect, would indicate that the differences found are presented in certain writing skills and they are not an expression of a general superiority of women over men (Dioses, et al., 2014; García, 2003).

The results based on grade of studies indicate that sixth grade students perform better than fifth grade students in story writing, dictation of words with regulated spelling and dictation of pseudo-words, although these differences are not important at the practical level. In this sense, findings would be in relation to those of Dioses et al. (2014), who point outs that there are no expected differences in dictation of words and pseudo-words among students in grades 5th and 6th of elementary education, as well as in accentuation, exclamation and question marks. This result shows little variability in the performance of writing as a consequence of a limited lexical and spelling stimulation for the grade they are taking.

According to immediate auditory memory, although there is a study about its relation with difficulties in learning spelling (Dioses, 2003), the results of the present research are the first to provide evidence about the difference in immediate auditory memory between men and women in Peruvian context, although these is not of practical importance. The previous would consider the same results with caution suggesting their verification in later studies.

However, findings would express that they would perform better in the ability to memorize verbal information (Matute et al, 2009). This can be explained by early language development and expressed in an increase in vocabulary and better linguistic constructions (Fenson, et al., 1994; Matute et al, 2009; Morrisset, Barnard & Booth, 1995).

Similarly, there is a direct and moderate relationship (Rho=.694) among some writing tasks and types of memory. Thus, writing presents low correlations with associative and numerical memory, being the last one the lowest. One tentative explanation for this finding is the type of memory that puts the writing tasks into operation. Numerical operations put into operation the visuospatial store of notes, while writing uses resources of phonological memory, which is similar to the concept of immediate auditory memory (Baddeley et al., 2010).

These results with the report of another research that argues that the greater complexity of a text will require a greater capacity of memory, specifically of the operant of the verbal type; however, the research was performed in an adult population (Hoskyn & Swanson, 2003). Nevertheless, correlations between the dimensions of each of the variables are low, that may be influenced by the participation of other cognitive variables (Berninger et al, 2008) such as: oral expression (Dyson, 1983), attention (Nydén, Gillberg, Hjelmquist, & Heiman, 1999), level of reading (Berninger, Cartwright, Yates, Swanson & Abbott, 1994), level of psychomotricity (Pescari & Popescu, 2012) morphological awareness (Mann, 2000), maturity, language and intelligence (Levin & Contini de González, 2004). The last should receive special attention because it is directly related to academic performance (Good & Brophy, 1999) and learning language (Arias & Llamosas, 2011).

Despite the results obtained, there are some limitations to consider. Firstly, it used a non-probabilistic sampling type, not having included different sectors of the north of Metropolitan Lima, for this reason the results may not be taken as conclusive for the whole city. Secondly, IAM requires a more up-to-date analysis because its last revision was in 2002. Finally, it


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has not been considered as intervening variable to the intelligence, so the relationship between memory, writing and other mediating variables should be further explored.

In conclusion, results demonstrate that although there are differences in the performance of writing and auditory memory according to sex and grade of studies, they is not of practical importance. Furthermore, there is a moderate, direct and significant correlation between immediate auditory memory and writing tasks in general and there is a low correlation between their dimensions. Likewise, future studies should emphasize in the study about the type of specific memory that is related to a better performance of the writing tasks and the type of methodologies used for the teaching of writing (Concha, Aravena, Coloma & Romero, 2010). In this sense, although there are moderate and low correlations, the report of this study is important as a starting point for the study of strategies that improve memory capacity in Peruvian schoolchildren.

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