

A CALL to ARMS: TIME TO DO COGNITIVE SCIENCE in LATIN AMERICA

MANOS A LA OBRA: HORA DE HACER CIENCIA COGNITIVA EN LATINOAMÉRICA

Fernando Marmolejo-Ramos

School of Psychology, Faculty of Health Sciences, University of Adelaide, Australia.

ABSTRACT

Previous theoretical reviews about the development of Psychology in Latin America suggest that Latin American psychology has a promising future. This paper empirically checks whether that status remains justified. In so doing, the frequency of programs/research domains in three salient psychological areas is assessed in Latin America and in two other regions of the world. A chi-square statistic is used to analyse the collected data. Programs/research domains and regions of the world are the independent variables and frequency of programs/research domains per world region is the dependent variable. Results suggest that whereas in Latin America the work on Social/Organizational Psychology is moving within expected parameters, there is a rather strong focus on Clinical/Psychoanalytical Psychology. Results also show that Experimental/Cognitive Psychology is much underestimated. In Asia, however, the focus on all areas of psychology seems to be distributed within expected parameters, whereas Europe outperforms regarding Experimental/Cognitive Psychology research. Potential reasons that contribute to Latin America's situation are discussed and specific solutions are proposed. It is concluded that the scope of Experimental/Cognitive Psychology in Latin America should be broadened into a Cognitive Science research program.

Keywords: Psychology in Latin America, Clinical Psychology, Psychoanalysis, Cognitive Psychology, Experimental Psychology, Cognitive Science.

RESUMEN

Revisiones teóricas acerca del desarrollo de la Psicología en Latino América sugieren que la Psicología en Latinoamérica tiene un futuro promisorio. Este artículo revisa empíricamente si esa afirmación es justificada. De tal modo, se evalúa la frecuencia de programas/áreas de investigación en tres ramas características de la Psicología en Latinoamérica y en otras dos regiones del mundo. Los datos son analizados a través de un chi-cuadrado que usa las regiones del mundo y programas/áreas de la psicología como variables independientes y la frecuencia de programas en las áreas de la psicología por región del mundo como variable dependiente. Los resultados sugieren que en Latinoamérica el trabajo en Psicología Social y Organizacional se mueve dentro de parámetros esperados. Sin embargo, existe un énfasis fuerte en Psicología Clínica y Psicoanalítica, mientras que la Psicología Experimental y Cognitiva se halla mucho más descuidada. En Asia, por el contrario, los énfasis en tales áreas están distribuidos dentro de parámetros esperados, mientras en Europa el trabajo en Psicología Experimental y Cognitiva supera los parámetros esperados. Se consideran las razones que influyen la situación observada en Latinoamérica y se proponen soluciones específicas que pueden mejorar esa condición. Se concluye que la investigación en Psicología Experimental y Cognitiva en Latinoamérica debe consolidarse en un programa de trabajo en Ciencia Cognitiva.

Palabras clave: Psicología en Latinoamérica, Psicología Clínica, Psicoanálisis, Psicología Cognitiva, Psicología Experimental, Ciencia Cognitiva.

Fecha de recepción/Date of reception: 15/9/2008
Fecha de aprobación/Date of approval: 6/10/2008

Dirección de correspondencia/Mail address: Fernando Marmolejo-Ramos
School of Psychology, Faculty of Health Sciences
University of Adelaide
Adelaide
South Australia
Australia, 5005.
E-mail: fernando.marmolejoramos@adelaide.edu.au

Author note:

I would like to thank John Dunn and Rosalyn Shute for their comments on this paper. Finally, I particularly thank Yuka Toyama for assisting me with the figures and translating the information reported in the four universities explored in Japan.

Undoubtedly, psychological science has gained a privileged position around the world. Different areas of psychology are being investigated and taught at postgraduate level, and new techniques and methods are being implemented. This scenario is particularly clear in universities which count on research clusters in specific areas and offer specialised degrees at a postgraduate level. What is more important, the research and training achieved in those institutions has made an international impact.

Psychological research around the world has contributed, in one way or another, to enrich specific areas of psychology. For example, in Asia, the work on primate cognition developed in Japan has impacted greatly upon the international landscape (see Beran & Rumbaugh, 2001; Watanabe, 2004). European countries have made inroads into psychology at all levels; for example, Santiago Ramón y Cajal's work laid the principles for current neuroscience (see Sotelo, 2003) and Sigmund Freud the basis of Psychoanalysis. And in Latin America, the work of psychologist Ignacio Martín Baró has influenced European and North American Social Psychology (see Burton & Kagan, 2005). Thus, specific areas such as Cognitive, Psychoanalytical, and Social Psychology have been benefited from work in different latitudes.

It has been argued that Latin American psychology is faring well in all of the abovementioned areas of psychology. In particular, previous reviews suggest that Latin America is offering a comprehensive number of postgraduate programs and/or has enough research clusters in several areas of psychology. Both psychology research programs and research clusters are here considered as an index of development in the field. The purpose of this paper is to check whether Latin America's Psychology is really faring well, especially with respect to cognitive and experimental psychology. Thus, the paper presents first some concepts and considerations to be taken into account for this particular paper. Secondly, a concise overview of the three major branches of psychology in Latin America is presented. Thirdly, the particular case of experimental and cognitive psychology in the Latin American context is reviewed. The introduction of this paper concludes with an outline of the research hypothesis for this study.

Some special considerations for this paper

- Psychology programs and research clusters are considered a good index of the development in the field anywhere in the world. Therefore, by exploring these indexes, a better idea can be obtained as to the current status of psychology in different world regions. In this study, Latin America's psychology is compared to that of Asia and Europe. However, indicators of the status of psychology in Asia and Europe are not analysed in detail since i) it goes beyond the scope of this paper, and ii) the main region of interest here is Latin America.
- Three major areas of psychology here are used for comparison: Clinical/Psychoanalytical, Organizational/Social, and Experimental/Cognitive Psychology. These areas are selected and considered together since they have, i) discernable differences between them, ii) obvious similarities within them, ii) and these three areas of psychology, alongside their differences and similarities, are of special interest in Latin America. For example, clinical Psychology can use psychoanalytically oriented Psychotherapy in order to relieve psychological dysfunctions. Then, Clinical Psychology and Psychoanalysis can be taken as a unity. Organizational Psychology can borrow paradigms from Social Psychology in order to devise intervention strategies for workplace issues. However, Clinical/Psychoanalytical Psychology might not use the same paradigms and methods used in Social/Organizational Psychology. The specific case of Experimental/Cognitive Psychology is considered next. It is worth clarifying at this point that general definitions are assumed to group the areas in the way they are presented here. Simply, they are clustered in this way to facilitate comparison purposes. Therefore, no particular epistemological differentiation among the areas mentioned here is neither assumed nor pursued in this paper.
- Experimental Psychology has more of a methodological connotation than a categorical one in Psychology. That is, Experimental Psychology refers to the use of experimental methodology in the study of human behaviour. Cognitive Psychology, meanwhile, refers to the study of specific cognitive processes such as problem solving, memory, and language, and uses experimental methodology to do so. Also, experimental methodology is regarded as being quantitative rather than qualitative. So, Experimental and Cognitive Psychology can be considered as part of a same group. However, in Latin America's context, Experimental

Psychology often refers to the experimental analysis of behaviour (e.g., modification of behaviour), whereas Cognitive Psychology refers to cognitive processes used in applied contexts (e.g., school scenarios).

- Cognitive science is an interdisciplinary combination of fields like Artificial Intelligence, Cognitive Psychology, Neuroscience, and Computer Science, essentially, for the study of mind and intelligence. More specifically, Cognitive Science can be regarded as the scientific study of cognition, where cognition stands for psychological activities necessary to cope with environmental and internal demands (see Froufe, 2003), and science stands for the systematic construction of knowledge by using the scientific method in its strictest sense (see Crawford & Stucki, 1990). This is precisely the level to which Experimental and Cognitive Psychology in Latin America should be taken. This paper offers some potential avenues to achieve that.

A concise characterization of Latin America's Psychology

Previous reviews on the topic (principally those authored by Rubén Ardila) suggest that three Psychology branches within the Psychology spectrum in Latin America have received particular attention: Clinical/Psychoanalytical, Social, and Experimental Psychology.

Psychoanalysis has a strong tradition in Latin America, especially in Argentina (see Ardila, 1968; Hereford, 1966; Mustaca, 2006), and has been quite influential in psychology in general and in Clinical Psychology in particular. For this reason, it is commonplace to find psychology programs/research groups in Clinical Psychology with Psychoanalytical elements and vice versa (see Calvache, López, & Mayorga, 2002). For example, the Universidad de la Concordia (Mexico) offers an M.A. in Gestalt psychotherapy. This particular degree offers courses in psychopathology, supervision of clinical cases, and Gestalt psychology.

Social Psychology is also a traditional focus area in Latin America and it has specialised into other branches, for example, community psychology (see Ardila, 1982, 2004) and pervaded others, like organizational psychology. As Social Psychology influences Organizational Psychology in that Organizational Psychology is in principle Social Psychology applied to organizations (see Mendes,

2002; Minsa & Pérez, 2007), it is also common to find programs/research areas dealing with both of these areas. The Universidad Rafael Landívar (Guatemala), for instance, offers courses on Social Psychology, sociological studies, and Guatemalan sociology, for the degree in Organizational/Industrial Psychology.

The first glimpses of Latin American Experimental Psychology began in 1954 with the publication in Lima of a book on Experimental Psychology (see Ardila, 1970). In the mid 1960s, Latin American psychology was influenced by North American behaviour analysts (Sánchez, & Valderrama-Iturbe, 2001). And then, during 1980 and 1990, studies on Cognitive Psychology took place (Ardila, 2004). This historical path seems to suggest that at the present time, Experimental and Cognitive Psychology (together with the previously mentioned areas of psychology) in Latin America should be making, or should have begun to make, inroads into the international arena. According to fairly recent reviews (e.g., Ardila, 2004; Sánchez, & Valderrama-Iturbe, 2001), this optimistic scenario seems to be unfolding.

The particular case of Experimental/Cognitive Psychology in Latin America

Experimental and Cognitive Psychology in Latin America are characterized mainly by studies on the experimental analysis of behaviour (see Ardila, 2006; Sánchez Sosa, & Valderrama-Iturbe, 2001) and educational psychology, based on cognitive development principles proposed by Piaget and Vygotsky (see Ardila, 2004). The former has been productive regarding animal behaviour and behaviour modification specifically (e.g., Camacho, Irigoyen, Gómez, Jiménez, & Acuña, 2007), but has scarcely extended to studies of human higher-level cognitive processes. The latter has developed classical ideas proposed by Piaget and Vygotsky (e.g., Puche-Navarro, & Millán, 2007), but has overlooked recent advances in connectionist developmental cognitive neuroscience (see Westermann, Sirios, Shultz, & Mareschal, 2006). Moreover, as the research focuses on applied contexts, such as learning-teaching scenarios, it has not permitted a valuing of the role of basic cognitive processes in applied research.

It has been argued that Latin America's Psychology is more inclined towards applied than basic research (see Salazar, 1995), and that premise seems to prevail given that science has not found a place in Latin America's Psychological research (see Ardila, 1982). Latin

America's Psychology should be aware of the immense contribution of basic research to applied research. For example, research on embodied cognition has demonstrated usefulness in educational contexts (e.g., Glenberg, Brown, & Levin, 2007; Marmolejo-Ramos, 2007), and research on cognitive neuroscience has contributed to the development of clinical interventions for patients with psychological impairments (e.g., Yang et al., 2007). Therefore, basic research should be regarded as a way of placing applied work on solid footing.

The topics covered by Experimental/Cognitive Psychology in Latin America are also current topics of interest on the international stage. However, a wider range of topics is worth the attention of Latin American psychologists. For example, international Experimental/Cognitive Psychology is currently also dealing with topics such as object recognition (e.g., Mash, Arterberry, & Bornstein, 2007), category induction (Ratcliff, 2004), episodic memory (e.g., Rubin, 2006), and embodied cognition (Barsalou, 2008). It is important to remember that Cognitive Psychology studies internal mental processes such as problem solving, memory, and language and uses the experimental method to achieve that. Therefore, Experimental/Cognitive Psychology in Latin America needs to broaden its research scope to other topics in basic research in order to catch up with the current international field. More importantly, newer research paradigms and methodologies should be adopted. A first basic step to do so is to implement the use of computers more intensively in psychological research (see Hereford, 1966).

Scientific publications and specialised societies serve as an index of psychological research activity and most importantly to measure integration with the international context. There are Latin American journals specialising in different psychological branches such as Clinical/Psychoanalytical (e.g., *Avances en Psicología Clínica Latinoamericana*), and Social and Organizational (e.g. *Psicología & Sociedad*). Journals specialising in Experimental and Cognitive Psychology, however, seem absent. Also, there are societies dedicated to general, (e.g., *Sociedad Interamericana de Psicología*), and specific areas of Psychology, like the *Federación Psicoanalítica de América Latina*. But again, there are no societies in Latin America dedicated to bringing together researchers doing Experimental and Cognitive work.

This lack of a basic research atmosphere in Latin America has caused many researchers to seek training or establish their careers overseas (see Özden, 2006). Just to mention a few cases, Rodolfo Llinás is a Colombian-born researcher at New York University investigating the intrinsic properties of neurons, Roberto Cabeza is an Argentinean-born researcher at Duke University investigating the cognitive neuroscience of memory, and Rafael Núñez is a Chilean-born researcher at University of California, San Diego, investigating cognition from the perspective of the embodied mind. There are cases, though, when researchers receive training overseas and return to Latin America to build their own research clusters, e.g., Emilia Ferreiro, after working with Piaget at Geneva University, returned to Mexico to continue with her work on Genetic Psycholinguistics, and Humberto Maturana and Francisco Varela, developers of the concept of autopoiesis (see Luisi, 2003), returned to Chile to continue their work on neuroscience. This latter trend is rather unusual, and is likely not to be maintained because an Experimental/Cognitive research atmosphere has not yet been consolidated in Latin America.

Research hypothesis of the present study

Despite the arguments raised above, it is generally assumed in the literature that the development of Psychology in Latin America is on the right track (see Ardila, 1982, 2004; Sánchez, & Valderrama-Iturbe, 2001). The present study aims to determine whether that contention holds. In general, it is expected to find that the three areas of psychology in Latin America are performing within expected values, and those values do not differ significantly from the other regions of the world. In particular, it is expected to find a good number of research foci and programs offered in Experimental and Cognitive Psychology in Latin America or, better yet, that the work in these areas has surpassed expected values. Results like these would confirm the idea of an optimistic panorama in Latin American psychology.

On the contrary, an alternative hypothesis would suggest that in Latin America the work on Experimental and Cognitive Psychology, and perhaps other areas, is simply not enough. If such results are obtained, then it is necessary to discuss why that could be the case and what can be done to overcome that situation.

METHOD

Sample

Three world regions were selected for comparison, Latin America, Asia, and Europe with regard to their psychology programs and research foci offered. From every region, 10 countries were randomly selected. The psychology websites of 4 universities per country were also randomly selected to be explored (40 universities per region) in order to look for the psychology programs and the research areas they had. After exploring all the universities' web sites, a total of 264 psychology programs/research foci were found: 83 in Latin America, 84 in Asia and 97 in Europe (see Figure 1).

Design

The independent variables studied for association were regions of the world and psychology program/research foci. The region of the world variable was composed of the 3 categories mentioned above: Latin America, Asia, and Europe. These regions cover several countries around the world which have made inroads in psychology or have begun to undertake work in psychology. The psychology program/research foci variable consisted of 3 categories which represent the three major and most differentiable branches in psychology: Clinical/Psychoanalysis, Organizational/Social, and Experimental/Cognitive. The dependent variable was the amount of programs/research foci offered in each area of psychology per region of the world.

Procedure

The psychology institutions of 4 universities per country were explored in order to look for the areas of strength and psychology programs offered. Whenever a university in any country did not have a psychology institution or it did not mention anything about research foci and programs offered in psychology, another random university web site was explored for that country.

The criteria for determining whether a program could be categorized as belonging to any of the three categories for the psychology program/research foci variable, were: a) that the psychology website offered

a description of the program offered and degree obtained (principally specializations, M.A. and PhD), or b) that the psychology institution had research centres (e.g., groups, clusters, laboratories) specifically focused on particular psychology areas (i.e., clinical/psychoanalysis, organizational/social, and experimental/cognitive). It is worth clarifying at this point that one psychology institution can offer several specializations and/or can have research groups in different psychology areas of psychology (e.g., Universidade Federal de Pernambuco – Brazil -, has research groups in clinical, social, and cognitive psychology; whereas Allahabad University – India -, has a research centre mostly dedicated to behavioural and cognitive sciences). This means that what is being measured here is the frequency of programs/research foci offered by a particular region of the world, regardless of the university hosting them.

RESULTS

The data were analysed using a chi-square statistic in which the association between the two variables was tested. Observed and expected frequencies are reported. Most importantly, adjusted residuals were calculated to determine significant differences between observed and expected frequencies in particular cells.

The chi-square test suggested that there was a significant association between the region of the world and the psychology program/research area focus, $\chi^2(4, N = 264) = 11.765, p = 0.019$ (Cramer's $V = 0.149, p = 0.019$). Figure 2 shows the main results.

The adjusted residuals show the specific cells that explain such association. The case of Asia seems to move within expected values. The results suggest that in Asia the psychology programs and research emphasis seem to be evenly distributed throughout different areas in psychology. Europe shows significant values with respect to Experimental and Cognitive Psychology. Psychology institutions in this area seem to have a strong commitment regarding experimental research and programs focused on Cognitive Psychology.

Whereas the amount of research and programs available in Organizational and Social Psychology seems to fit expected values in Latin America, it seems that work on Clinical Psychology and Psychoanalysis is a matter of special interest in this part of the world. However, a less promising scenario occurs regarding the case for

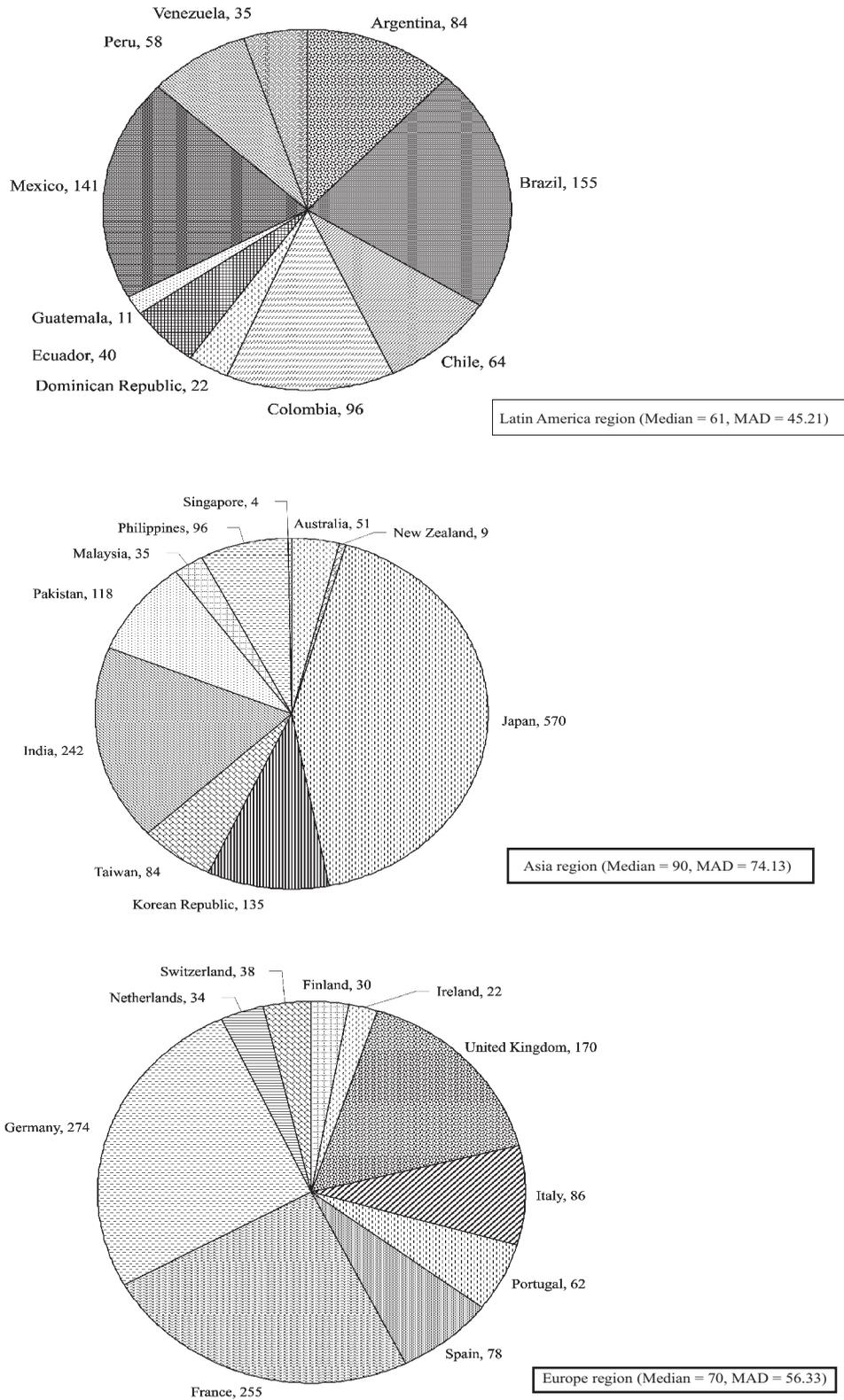


Figure 1. Selected regions and countries for study. The pies also show the number of universities and academic institutions per country in every region (source International Association of Universities). The median and median absolute deviation (MAD) per region are presented.

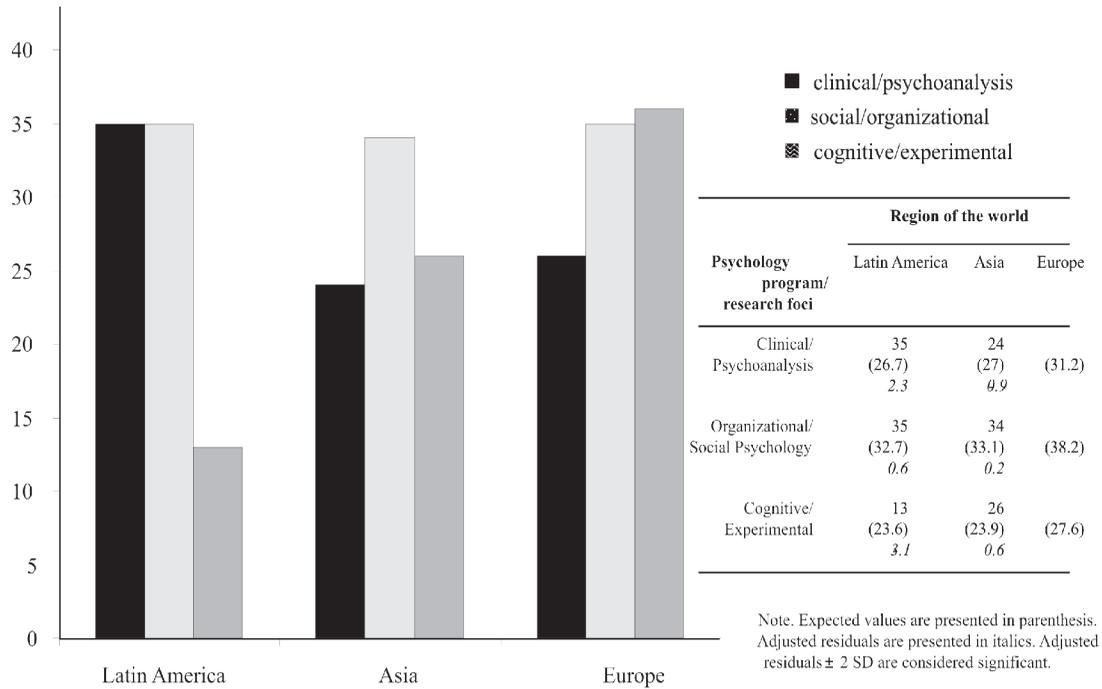


Figure 2. Main figure – frequency of psychology programs/ research foci by world region. Inset shows observed values (frequencies), expected values, and adjusted residuals for each cell.

Experimental and Cognitive Psychology. The results suggest that in Latin America these areas of study have been neglected. This particular point will be discussed next in more detail.

DISCUSSION

Psychology is a very widespread discipline around the world and has been benefited by developments in different regions. In Asia, it seems that different areas in Psychology are being addressed simultaneously. There are several universities throughout Asia offering either specialised programs in psychology and/or building knowledge in certain areas via research clusters. For example, the Psychology Department at the National University of Singapore not only has research laboratories dedicated to cognitive and physiological research, but also offers graduate programs in Clinical Psychology.

Europe has enjoyed a long standing and well documented tradition in different areas of Psychology, so it is redundant to elaborate further on this. What is important to stress is Europe's notorious contribution to Experimental and Cognitive Psychology (results showed observed

values above expected values). By just browsing any website of any European university, it is evident that most Psychology institutions have both psychology programs and research groups in specific fields. For example, the Department of Psychology at University of Turku (Finland) has programs specialised in Clinical, Social, and Cognitive Psychology. Moreover, the university has research centres in each of those areas.

In Latin America the distribution of psychology programs and research clusters seems to be more heterogeneous. Whereas there are programs and/or research clusters strongly focused on Clinical and Organizational Psychology, there is a clear lack of work on Experimental and Cognitive Psychology. One probable reason for that is that, in the universities explored for this study, it was common to find that either there were graduate programs in specific areas but not research clusters dedicated to investigate those areas or that research areas were confined to only one particular staff member. Nevertheless, that was not always the rule and there were exceptions. For example, the Institute of Psychology at the Universidad del Valle (Colombia) offers M.A. and PhD programs in Cognitive and Organizational Psychology and also has a research centre dedicated to these and other areas.

The critical situation of Experimental and Cognitive Psychology in Latin America raises a twofold question: why is Experimental/Cognitive Psychology so underdeveloped in Latin America? And what can be done to overcome that situation? One reason that underpins this situation is the lack of infrastructural conditions (Salazar, 1995). I believe, however, that another factor that contributes to the light treatment of Experimental and Cognitive Psychology in Latin America is the lack of research training (see Marmolejo-Ramos Mosquera, & Jiménez, &, in press). Next, I discuss these reasons in more detail.

Lack of infrastructure conditions and solutions

Salazar (1995) argues that the development of psychological research in Latin America has been hindered because of financial constraints and lack of infrastructure. Specifically, it is argued that “cognitive research has endured many years of lack of resources due to the economic conditions in America Latina” (p. 392, Sánchez, & Valderrama-Iturbe, 2001). I do agree with that statement; however, I think this is not an excuse not to do cutting-edge research.

Currently, international research done in Experimental and Cognitive Psychology uses advanced technological equipment. Behavioural experiments are a trademark of basic research, and specific hypothesis are readily tested (e.g., Zwaan, & Taylor, 2006), but that is not always the case and brain imaging techniques are necessary (e.g., Tlauka, Keage, & Clark, 2005). For example, researchers in language processing can use EEG, fMRI, and MEG to find neural correlates of cognitive activity (see van Berkum, 2004). Researchers investigating how people parse texts use eye tracking systems (see Arnold, Eisenband, Brown-Schmidt, & Trueswell, 2000). And researchers investigating body representations use point-light displays (see Clarke, Bradshaw, Field, Hampson, & Rose, 2005).

However, other researchers opt for “lab-made” devices which, cleverly handcrafted, permit researchers to answer the same research questions. A good example is presented by Manu Kumar at Stanford University, who engineered a low-cost way to track eye movements using commercial webcams (Kumar, n.d.). It is common to think, also, that researchers in neuroscience use brain imagery techniques by default to explain how the brain works.

However, in a recent experiment, Mike Nicholls and colleagues at Melbourne University (Nicholls, Loftus, Meyer, & Mattingley, 2007) studied lateralized bumping (attentional bias towards the left side of the body given brain lateralization) by just asking participants to walk through a narrow doorway while the experimenter recorded the number of collisions.

It is also a common practice in Experimental and Cognitive research to use software for the presentation of stimuli, collection of response times, and statistical analysis. There is software devised to collect response times and present stimuli. Also, there are specific software packages to run statistical analysis. For example, some of the commercial packages used in psychology laboratories to present stimuli and collect data are E-Prime, Superlab, and MATLAB (with Psychtoolbox). SPSS, SAS, and STATISTICA are some of the commercial softwares used to run statistical analysis (all of these packages cost around \$1000 USD each).

Fortunately, there is freeware that does the same job as commercial software. For example, there are open sources for the presentation of stimuli and collection of response times like DMDX (Forster, & Forster, 2003), TScope (Stevens, Lammertyn, Verbruggen, & Vandierendonk, 2006), and PsyScope (especially for Macintosh users, Cohen, MacWhinney, Flatt, & Provost, 1993; see Ferreira, Boyd, Elman, Buffington, & Slevc, 2006 for a comparison of some of these packages). A more specialised freeware for vision research is Vision Egg (Straw, Warrant, & O'Carroll, 2006). All of these packages are commonly used in several psychology laboratories around the world given that they enable researchers to automatize experiments and obtain more accurate measures of the timing of cognitive processes (see Curtin, Lozano, & Allen, 2007).

Finally, some of the freeware designed for the analysis of statistical data is R-programming language (R Project for Statistical Computing, 2007) and a variety of MATLAB clones like Scilab, Octave, and Rlab (see Iowegian International Corporation, n.d.). Indeed, R is increasingly becoming a tool to perform statistical analysis in many sciences, and psychology has not been unaware of it (e.g., Ravelle, 2008).

Lack of research training and solutions to overcome it

A major cause of the lack of funding for research is the lack of training in research. Salazar (1995) argues that lack of adequate research projects is linked, again, to the

economic situation regarding research training. He argues that socio-economical factors lead postgraduate students to take part-time jobs while doing their post-graduate work. So, students cannot do their research training full-time, only part-time, which in turn causes students' research training to be incomplete.

Research training skills are put into practice when writing up research projects aimed to attract funding. Then, if students do not count on full-blown research training, any research project they submit will be, in most cases, unsuccessful. I agree with the idea that lack of research funding is affected by lack of research training. However, I do not think that only socio-economic factors determine the quality of research training. I do think that the psychology program/research centre in the training institution also has a central role in that process (see Marmolejo-Ramos et al., in press). If students are not provided with the specific research skills, they will not know how to deal with research-related general demands, like grant applications. Instead, if more theoretical psychology is provided, students will not know how to deal with specific research-related tasks, like methodological considerations to be outlined in grant applications.

Then, it is my position that more emphasis is needed on specific research skills than on theoretical issues in psychology. Previous reviews indicate that Psychology in Latin America tends to emphasise theory and knowledge, more than on practical and applied issues (Hereford, 1966). This situation has improved regarding practical and applied issues, but there is still a preference for theoretical issues rather than basic research. Theory can be learnt from books, whereas research skills need books plus hands-on practice. More interestingly indeed, theoretical paradigms in Psychology are better grasped when analysed in terms of their methodological possibilities. By specific research skills, I refer particularly to quantitative methodology components such as statistics, measurement, and research designs. In a recent survey of all PhD programs in Psychology in the U.S.A. and Canada (Aiken, West, & Millsap, 2008) it was found that i) there is strong training in experimental research, and that ii) PhD students spend a median of 1.6 years of training in quantitative methodology. This scenario, although specific to North America's Psychology, sends a clear and helpful message to Latin America's

Psychology: in order to have a high level of research training in Psychology, more emphasis should be put on quantitative methodology.

The advantages of having a strong background in quantitative methodology undoubtedly pay off. For example, having good quantitative skills permits researchers to write better research proposals. If there is sufficient knowledge of research designs, a coherent narrative could be written as to what equipment is required, how it will be used, and what the expected outcomes are. Indeed, taking up again the lack-of-funding-for-research topic, a strong research proposal should persuade the funding institution of the importance of acquiring particular equipment. Furthermore, thinking of Latin America's inclination towards applied Psychology research (see Ardila, 1968, 2004), even research projects on basic cognitive processes can be presented in such a way that their applied implications are straightforward.

Books are a well known source of knowledge, and there are currently many textbooks which offer quite a complete guide to get to grips with quantitative methodology. Aiken et al. (2008) offer a good list which I would like to complement with other up-to-date sources. For example, Field (2005) offers a user-friendly book on statistics and SPSS, Marques de Sá (2007) a text on the implementation of applied statistics using SPSS, STATISTICA, MATLAB and R language, Rosenbaum (2007) presents a book on MATLAB for psychological research purposes, and Davis (2005) a complete handbook on research methods.

One of the most relevant conclusions raised by Aiken et al. (2008) is that training in quantitative methodology should embrace current advances in this area. They mentioned some new techniques in quantitative methodology that have started to be adapted to current psychology research. For example, besides canonical statistical procedures like ANOVAs, newer topics have started to be implemented in psychological research, like structural equation modelling and multilevel statistical modelling. I would also add a recent trend towards Bayesian statistics as an alternative way to test hypotheses (see Hoshino, & Shigemasa, 2008; Miles & Field, in press; van der Linden, & Guo, in press), and the need to consider more in depth the usage of non-parametric statistics, and statistical power analysis (see Faul, Erdfelder, Lang, & Buchner, 2007; by the way, G*power is a free program to perform statistical power analysis).

As mentioned earlier, Experimental Psychology is here understood as the use of experimental methodology in the study of human behaviour. Also, it was assumed that experimental methodology is regarded as being quantitative rather than qualitative. Experimental Psychology should constitute the toolbox for doing Cognitive Psychology so that it develops as a science in Latin America. However, the ideal further step to take is to broaden Experimental and Cognitive Psychology into the realm of Cognitive Science. Then, a formal study of mind and intelligence could start to take place in Latin American universities.

CONCLUSIONS

This paper is a call to arms for taking Experimental/Cognitive Psychology in Latin America more seriously and take it to the next level in the form of a Cognitive Science research program. Basic research on a greater diversity of topics in cognition needs to be done, newer quantitative methodologies need to be implemented, and a stronger impact should be made in the international research arena. Some alternatives are proposed in this paper. More importantly, specific societies, task forces, and journals should begin to be founded. It is time to create an ambience of Cognitive Science in Latin America so that brain-drain movements come to an end.

REFERENCES

- Aiken, L. S., West, S. G., & Millsap, R. E. (2008). Doctoral training in statistics, measurement, and methodology in Psychology. *American Psychologist*, *63*(1), 32-50.
- Ardila, R. (1968). Psychology in Latin America. *American Psychologist*, *23*, 567-574.
- Ardila, R. (1970). Landmarks in the history of Latin American Psychology. *Journal of the History of the Behavioral Sciences*, *6*(2), 140-146.
- Ardila, R. (1982). Psychology in Latin America today. *Annual Review of Psychology*, *33*, 103-122.
- Ardila, R. (2004). La psicología en Latinoamérica: El primer medio siglo. *Revista Interamericana de Psicología*, *38*(2), 317-322.
- Ardila, R. (2006). The experimental synthesis of behavior. *International Journal of Psychology*, *41*(6), 462-467.
- Arnold, J. E., Eisenband, J. G., Brown-Schmidt, S., & Trueswell, J. C. (2000). The rapid use of gender information: Evidence of the time course of pronoun resolution from eye tracking. *Cognition*, *76*, B13-B26.
- Barsalou, L. W. (2008). Grounded cognition. *Annual Review of Psychology*, *59*, 617-645.
- Beran, M. J., & Rumbaugh, D. M. (2001). Comparative cognitive science and the Japanese influence in primatology [media review]. *American Journal of Primatology*, *55*(3), 183-185.
- Burton, M., & Kagan, C. (2005). Liberation Psychology: Learning from Latin America. *Journal of Community and Applied Social Psychology*, *15*(1), 63-78.
- Calvache, O., López, W. & Mayorga, E. (2002). Psicología clínica: 20 años de la revista Avances en Psicología Clínica Latinoamericana. *Avances en Psicología Clínica Latinoamericana*, *20*, 11-30.
- Camacho, J. A., Irigoyen, J. J., Gómez, D., Jiménez, M. Y., & Acuña, K. F. (2007). Adquisición y transferencia de modos lingüísticos en tareas de discriminación condicional sin retroalimentación reactiva. *Enseñanza e Investigación en Psicología*, *12*(1), 79-91.
- Clarke, T. J., Bradshaw, M. F., Field, D. T., Hampson, S. E., & Rose, D. (2005). The perception of emotion from body movement in point-light displays of interpersonal dialogue. *Perception*, *34*, 1171-1180.
- Cohen J.D., MacWhinney B., Flatt M., and Provost J. (1993). PsyScope: A new graphic interactive environment for designing psychology experiments. *Behavioral Research Methods, Instruments, and Computers*, *25*(2), 257-271.
- Crawford, S., & Stucki, L. (1990). Peer review and the changing research record. *Journal of the American Society for Information Science*, *41*(3), 223-228.
- Curtin, J. J., Lozano, D., & Allen, J. B. (2007). The psychophysiology laboratory. In J. A. Coan & J. B. Allen (Eds), *The Handbook of emotion elicitation and assessment* (pp. 398-425). New York: Oxford University Press.
- Davis, S. F. (Ed.) (2005). *Handbook of research methods in experimental psychology*. New York: Wiley-Blackwell.
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175-191.

- Ferreira, V., Boyd, J., Elman, J., Buffington, R., & Slevc, B. (2006). *Behavioral experiment software survey results*. Retrieved September 17, 2008, from University of California, San Diego, Language Production Laboratory website http://lpl.ucsd.edu/LabPage/Lab_Blog/B1A6A7D2-0069-41E3-89E9-B3683FEEC758.html
- Field, A. (2005). *Discovering statistics using SPSS*. London: SAGE publications.
- Forster, K. I., & Forster, J. C. (2003). DMDX: A windows display program with millisecond accuracy. *Behavior Research Methods, Instruments, & Computers*, 35(1), 116-124.
- Froufe, M. (2003). Disociaciones entre cognición y conciencia: Hacia un modelo multimodular e integrado de la mente. *Estudios de Psicología*, 24(2), 163-188.
- Glenberg, A. M., Brown, M., & Levin, J. R. (2007). Enhancing comprehension in small reading groups using a manipulation strategy. *Contemporary Educational Psychology*, 32(3), 389-399.
- Hereford, C. F. (1966). Current status of Psychology in Latin America. *Latin American Research Review*, 1(2), 97-108.
- Hoshino, T., & Shigemasu, K. (2008). Standard errors of estimated latent variable scores with estimated structural parameters. *Applied Psychological Measurement*, 32(2), 181-189.
- Iowegian International Corporation. (n.d.). *Matlab clones*. Retrieved September 17, 2008, from http://www.dspguru.com/sw/opensp/mat_hcl02.htm
- Kumar, M. (n.d.). *Reducing the cost of eye tracking systems*. Retrieved September 17, 2008, from Stanford University, Human-Computer Interaction Group web site <http://hci.stanford.edu/cstr/reports/2006-08.pdf>
- Luisi, P. L. (2003). Autopoiesis: a review and a reappraisal. *Naturwissenschaften*, 90, 49-59.
- Marmolejo-Ramos, F. (2007). Niños con dificultades de aprendizaje: Los textos narrativos como un recurso de intervención. *Psicologica*, 44, 97-109.
- Marmolejo-Ramos, F., Mosquera, S., & Jiménez, A. T. (in press). Ser un (joven) investigador en Psicología. Reflexiones basadas en la experiencia y propuesta de parámetros ideales. *Liberabit*.
- Marques de Sá, J. (2007). *Applied statistics using SPSS, STATISTICA, MATLAB and R*. Springer.
- Mash, C., Arterberry, M. E., & Bornstein, M. H. (2007). Mechanisms of visual object recognition in infancy: Five-month-olds generalize beyond the interpolation of familiar views. *Infancy*, 12(1), 31-43.
- Mendes, A. M. B. (2002). Algunas contribuciones teóricas do referencial psicanalítico para as pesquisas sobre organizações. *Estudos de Psicologia*, 7, 89-96.
- Miles, J. M. V., & Field, A. P. (in press). Perspectives on significance testing. *Irish Journal of Psychology*
- Minsal, D., & Pérez, Y. (2007). Hacia una nueva cultura organizacional: la cultura del conocimiento. *Acimed*, 16(3).
- Mustaca, A. B. (2006). La psicología científica y el análisis del comportamiento en Argentina. *Avances en Psicología Latinoamericana*, 24, 13-27.
- Nicholls, M. E. R., Loftus, A., Meyer, K., & Mattingley, J. B. (2007). Things that go bump in the right: The effect of unimanual activity on rightward collisions. *Neuropsychologia* 45, 1122-1126.
- Özden, Ç. (2006). *Brain drain in Latin America*. Retrieved September 17, 2008, from United Nations Secretariat, Department of Economic and Social Affairs web site http://www.un.org/esa/population/meetings/IttMigLAC/P10_WB-DECRG.pdf
- Puche-Navarro, R., & Millán, R. (2007). Inferential functioning in visually impaired children. *Research in Developmental Disabilities*, 28, 249-265.
- R Project for Statistical Computing. (2007). R [Computer software]. Retrieved September 17, 2008, from <http://www.r-project.org>
- Ratcliff, R. (2004). Comparing exemplar and rule-based theories of categorization. *Current Directions in Psychological Science*, 15, 9-13.
- Ravelle, W. (2008). *Using R for psychological research: A simple guide to an elegant package*. Retrieved September 17, 2008, from <http://www.personality-project.org/r/>
- Rosenbaum, D. A. (2007). *MATLAB for behavioral scientists*. Mahwah, N.J.: Lawrence Erlbaum Associates.
- Rubin, D. C. (2006). The basic-system model of episodic memory. *Perspectives on Psychological Science*, 1(4), 277-311.
- Salazar, J. M. (1995). Factors influencing the development of Psychology in Latin America. *International Journal of Psychology*, 30(6), 707-716.

- Sánchez, J. J., & Valderrama-Iturbe, P. (2001). Psychology in Latin America: Historical reflections and perspectives. *International Journal of Psychology, 36* (6), 384-394.
- Sotelo, C. (2003). Viewing the brain through the master hand of Ramón y Cajal. *Nature Reviews Neuroscience, 4*, 71-77.
- Stevens, M., Lammertyn, J., Verbruggen, F., & Vandierendonk, A. (2006). Tscope: A C library for programming cognitive experiments on the MS Windows platform. *Behavior Research Methods, 38* (2), 280-286.
- Straw, A. D., Warrant, E. J., & O'Carroll, D. C. (2006). A 'bright zone' in male hoverfly (*Eristalis tenax*) eyes and associated faster motion detection and increased contrast sensitivity. *Journal of Experimental Biology, 209* (21), 4339-4354.
- Tlauka, M., Keage, H., & Clark, C. R. (2005). Viewing a map versus reading a description of a map: Modality-specific encoding of spatial information. *Cognitive Science, 29*, 807-818.
- van Berkum, J. J. A. (2004). Sentence comprehension in a wider discourse. Can we use ERPs to keep track of things? In M. Carreiras & C. Clifton Jr (Eds.), *The on-line study of sentence comprehension: Eyetracking, ERPs, and beyond* (pp. 229-270). New York: Psychology Press.
- van der Linden, W. J., & Guo, F. (in press). Bayesian procedures for identifying aberrant response-time patterns in adaptive testing. *Psychometrika*
- Watanabe, S. (2004). Comparative cognitive science in Japan. *Japanese Psychological Research, 46* (3), 137-140.
- Westermann, G., Sirios, S., Shultz, T. R., & Mareschal, D. (2006). Modeling developmental cognitive neuroscience. *Trends in Cognitive Sciences, 10* (5), 227-232.
- Yang, B., Chan, R. C. K., Zou, X., Jing, J., Mai, J., & Li, J. (2007). Time perception deficit in children with ADHD. *Brain Research, 1170*, 90-96.
- Zwaan, R.A., & Taylor, L.J. (2006). Seeing, acting, understanding: motor resonance in language comprehension. *Journal of Experimental Psychology: General, 135*, 1-11.