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RESEARCH ARTICLE

Level of Cognitive Biases of Representativeness and Confirmation in Psychology Students of three Bío-Bío Universities

Nivel de sesgos cognitivos de representatividad y confirmación en estudiantes de Psicología de tres universidades del Bío-Bío

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Summary

Cognitive biases are unreasonable ways of making decisions, often in a one-sided way. The objective of this research was to describe the level of representativeness and confirmation biases in Chilean psychology students, in order to know how this phenomenon occurs. The participants were 198 psychology students from three universities in southern Chile. The instrument was based on two cognitive tasks derived from Kanheman and Tversky. The data were analyzed through descriptive statistics and mean differences. The results indicate a high level of biases in the groups of students, in the two tasks evaluated; the representativeness bias presents differences among universities only in sub-task 1, as well as in task 2, related to confirmation bias. Likewise, there are differences in representation bias according to age and sex. The need to strengthen reasoning skills in the initial training of future psychologists, in order to improve skills related to decision making in the professional field is concluded.

Keywords: Biases; Cognition; Professional Training; Psychology

Resumen

Los sesgos cognitivos son formas no razonadas de tomar decisiones, a menudo de manera parcializada. El objetivo de esta investigación fue describir el nivel de sesgos de representatividad y confirmación en estudiantes de psicología chilenos, para conocer cómo se presenta este fenómeno. Los participantes fueron 198 estudiantes de psicología, de tres universidades del sur de Chile. El instrumento se basó en dos tareas cognitivas derivadas de Kanheman y Tversky; se analizaron los datos con estadística descriptiva y diferencias de medias. Los resultados indican alto nivel de sesgos en los grupos de estudiantes, en las dos tareas evaluadas; el sesgo de representatividad presenta diferencias entre universidades, solo en la subtarea 1, así como en la tarea 2, relacionada con sesgo de confirmación; así mismo se observan diferencias en sesgo de representación según edad y sexo. Se concluye la necesidad de fortalecer habilidades de razonamiento en la formación inicial de los futuros psicólogos y psicólogas, con la finalidad de mejorar las habilidades relacionadas con la toma de decisiones en el campo profesional.

Palabras Claves: Sesgos; Cognición; Formación profesional; Psicología

Introduction

In recent years the term heuristics, and specifically that of cognitive biases, is something that is becoming increasingly common; however, its studies focus mostly on areas such as engineering or marketing (Rodriguez, 2012). Although in the beginning the concept was understood from a probabilistic point of view, little by little it has been approaching the area of psychology through the studies carried out by psychologist and economist Daniel Kahneman and cognitive and mathematical psychologist Amos Tversky. They have conducted various research works where they present the concept of cognitive biases, defining them as unreasoned ways in which decisions are made, allowing deductions to be made without a high level of effort, which could cause decisions to be made in a biased or erroneous manner (Tversky & Kahneman, 1983).

This study aims to relate the issue of biases to the training of psychologists as this professional, in his role of supporting the community, is subject to having a strong influence on people, so it is necessary not to be influenced by an excessive number of embedded biases in any type of intervention as this is detrimental to decision-making. It should be taken into account how fundamental decision-making is for this professional in his job performance, as well as in all areas of development (Juliá, 2013) as each of his decisions needs to be conscious, and free of influence. The effect of biases on such decisions could trigger significant and determining consequences, negatively affecting the professional relationship and, therefore, the effectiveness to which the psychologist aspires in exercising his profession. However, it has not been possible to find studies

that analyze how these professionals address biases and heuristics in their professional performance, or how these skills are worked on in the university education in Chile.

Specifically, in this study we worked with the representativeness and confirmation biases. The first is understood as the probability of something happening, based on how much it represents or resembles our previous beliefs, ignoring other useful information regarding the situation or the problem (Kahneman, Slovic & Tversky, 1982). The confirmation bias is presented as the general tendency to look for or select information that confirms previous hypotheses, being resistant to information that contradicts it (Páez, Villarreal, Echeverría & Valencia, 1987; Nieto, 2002).

People tend to make quick decisions in different situations, stating that the ongoing situation will have only one meaning, ignoring that it is chosen by selecting one alternative against others. This is called tendency to premature cognitive rigidity, which leads to error because many times these interpretations are not correct; having a previous idea of how the world works or having an image of others in mind, new information is not examined or old information is re-examined, but instead, information is assimilated according to pre-existing ideas, and these are further reinforced (Martín & Alvarez, 2000; Rivas, 2008).

Having the ability as a person to discern among a series of alternatives is closely related to the decision-making process, even if it is only a part of it, since such process is carried out through several phases, according to Cortada (2008), going from identifying information to then define the decision process and thus create a series of alternatives and assess them to later choosing the one that best solves the problem, and assessing the results and the purpose of the process. Therefore, if a person wants to make a good decision or the best action in a question, it is advisable to take into account these steps as the basis for differentiation and ordering of the alternatives, which will eventually serve to satisfy, in some way, the uncertainty caused to him by the selection of alternatives for a given purpose.

It should be always taken into account that, when making a decision in a problem that causes uncertainty, the person is irremediably subject to the assessment of the alternatives, a phase in which their possible consequences, whether positive or negative, are evaluated to then choose the most appropriate alternative to the solution of the decision problem, which finally intends to assess the results of the process with respect to the problem-solving effectiveness, always evaluating each of the aforementioned phases (Nieto, 2002).

The studies conducted have specified two decision-making ways, each oriented to different definitions; one known as algorithms, and the other as heuristics. For the classification and interpretation of problems, the first step to solve them is by selecting steps that best suit, or are better known by, the individual, which is called algorithms (Morris & Maisto, 2001). The solution is guaranteed if the algorithm strategy is chosen because absolutely correct results are presented due to the fact that algorithms propose the effective resolution of problems through a fixed sequence of steps with correct reasoning, where the purpose is ensured; these are used massively in exact sciences and mathematics.

On the other hand, not all problems can be solved using algorithms. Where we do not know if the results to be obtained will be absolutely correct, or we are not sure of the possible solution to the problem, we resort to heuristics, understood as a set of simple rules that may not help us to solve the problem, but at least presents the ideas within our reach, depending on the heuristic method used for each question, thus achieving to speed up or slow down the solution (Morris & Maisto, 2001).

Kahneman and Tversky (quoted in Cortada, 2008) describe heuristics, which are presented as various intuitive judgments under uncertainty, mentioning that:

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> *Although heuristic intuition is distinguished from formative reasoning processes due to patterns of biased judgments. The heuristics are assessment procedures that are by no means irrational. They are normal intuitive answers, not only for highly complex problems but also for the simplest problems of plausibility, frequency, and prediction (p.69).*

The concept of heuristics, according to Muñoz (2011), is an "energy-saving" tool (p.6), because it allows a decision to be made without great effort and generally works in an acceptable way. However, when these heuristics do not lead to the right decision, they become biases, causing people to make decisions based exclusively on their preconceptions, without using optimal reasoning.

Likewise, Kahneman (quoted in Páez et al., 1987) defines heuristics as simple and efficient rules, the result of evolutionary or learning processes, proposed to explain how people make decisions and solve problems, usually complex, based on incomplete information, adapting their knowledge to the new information proposed, without greater cognitive effort in the process. When heuristics are used to solve complex problems, they often happen automatically, leading to cognitive biases. These terms are usually considered equal in everyday life, however, an appropriate theoretical definition leads to understand them and differentiate them with precision, understanding heuristics as a global concept, from which cognitive biases are derived (Tversky & Kahneman, 1983). Despite the great variety of biases (Nieto, 2002), this study considered two only: representativeness and confirmation biases.

The representativeness bias is defined as a judgment on the existing relationship between a sample and a population, which makes think that an event is probable if it seems to us representative of a larger class (Martín & Álvarez, 2000). Therefore, empirical research can be conducted on people, knowing what their representative judgments are in some situation and/or problem. In addition, it is understood as the similarity of a description with the stereotypes, ignoring the base rates and the doubts about the veracity of the description. In this way, the probability of something happening is judged based on how much it represents or resembles our previous beliefs, ignoring other useful information regarding the situation or problem. This is how fundamental elements in decision-making can be ignored, influenced by previous events (Tversky & Kahneman, 1983).

The confirmation bias was coined by English psychologist Peter C. Watson (1960, quoted in Rodriguez, 2012) through an experiment conducted on subjects whom he challenged to identify a rule applicable to three consecutive even numbers (two, four, and six), indicating that they met the rule. The subjects were expected to be able to create their own series waiting for the researcher's confirmation to corroborate whether or not they met the rule. Watson verified that the subjects were looking for only positive examples to confirm their hypothetical rule through the sequences (Rodríguez, 2012). Based on the above, the term can be defined as the general tendency to look for or select the information that confirms previous hypotheses; thus, people tend to take into account the information that confirms their hypotheses, being reluctant to information that contradicts them (Páez et al., 1987). This can be reflected in the tendency to use only the information that is most accessible, without any great effort to incorporate new schemes or information into the situation to be analyzed.

The biases are also related to prejudice since they are characterized by their easy acquisition and establishment, and by being very operational (Martín & Álvarez, 2000), which triggers an easy transmission from individual to individual, thus, being difficult to modify. Prejudice gives a vague idea about something that we often do not know, so the experience is presented as a favorable factor to achieve non-prejudiced because it is responsible for providing new information regarding the previously established schemes (Olmo, 2005).

It is imperative to recognize that the psychologist works every day with people during moments of extreme vulnerability, where the social and cultural characteristics of patients can be negatively judged if the impact of the biases in decision-making is not taken into consideration.

Taking into account the factors mentioned by Díaz-Lázaro (2011) such as "gender, socioeconomic status, race, ethnicity, physical and mental ability, sexual orientation, and migratory status, among others" (p.279), psychologists are not exempt from using biases or stereotyping, presenting negative attitudes toward patients based on preconceived ideas, which are presented as risk factors in the professional activity in any field of psychological specialization.

This is relevant because, despite proposals to strengthen the profession in Chilean universities (Calderón et al, 2014), and the fact that the development of thinking skills as part of transversal or generic competencies in professional training is a matter that is considered fundamental for practicing professionals, and is not always effectively developed in the training processes of psychologists (González, M., González I. & Vicencio, 2014; Juliá, 2013; Morales, Pino, Ricci, Saavedra & Zicavo, 2015; Suárez, 2011).

For this reason, the institutions of the Consortium of Public Universities of Chile (CUE) developed a project aimed at establishing a common structure for the training of professional psychologists based on seven specific macro-competences for the discipline, and ten generic competences, in order to establish common criteria for the development of the profession, in line with the current demands of society (Juliá, 2013).

Within these specific competences, those oriented to the psychological assessment process (at individual, group and institutional levels), and some generic competencies (critical thinking, strategic thinking, and problem-solving), can be linked to decision-making, and also to biases, which should be a matter of concern with regard to the training of future professionals; however, no such proposal is known in Chile. For this reason, the main objective of this study was to know the levels of representativeness and confirmation biases of the future professionals in the area of psychology in order to determine a probable characterization of these processes in Psychology university students of three Universities of the Biobío region.

Method

Study Design and Type

The study is quantitative because it is based on the collection of measurement-supported data. It adopted an exploratory design with a cross-sectional descriptive scope (Hernández, Fernández &. Baptista, 2010).

Participants

The study sample is non-probabilistic because the selection of elements does not depend on probability but on their characteristics, which need to be related to the research (Hernández et al., 2010). Consequently, the selection was made based on availability because the participants were present when the instruments were applied.

The population of this study was composed of Psychology students of three universities in southern Chile: the Bío-Bío University campus in Chillán, Development University in Concepción, and Saint Thomas University campus in Los Angeles. Based on the above, the sample selected in the study was 198 Psychology students between the first and third year in these three universities, of which 133 (67%) and 65 (33%) were females and males, respectively, aged ranging from 17 to 38 (M=21; SD=2.8). At institutional level, the sample consisted of 63 students

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from the Saint Thomas University (31.8%), 82 students from the Bío-Bío University (41.4%), and 53 students from the Development University (26.8%).

Instruments

The instrument used in this study is called *Cognitive Tasks*. Its structure is divided into two major tasks, one to measure the representativeness bias, and the other to measure the confirmation bias. This instrument has gone through an extensive process of adaptation, which began with Kahneman, then continued with Páez et al. (1987), and finally, a second adaptation was made by Da Costa (2014), which was used as the basis for this study. The instrument considers previous reliability data of the task of the representativeness bias showing a Cronbach alpha of 0.619 in a sample of pedagogy students of the Biobio region in Chile (Ossa, Díaz, Bruna and Cifuentes, 2016).

Two sub-tasks were applied in the representation bias. Sub-task one consisted in selecting a value (between 0 and 100) about the probability that a person is a librarian, doctor, or pilot respectively. Additionally, distracting information relating to personality aspects was presented. The indication of the sub-task is:

Choose the probability between 0 and 100 that Esteban is a librarian, doctor, or pilot. In a sample of people with higher education, the proportion of these professions in this population is low, about 1%. The information available on Esteban is as follows:

> *Esteban (case name) is very shy and withdrawn, always helpful, but not interested in people or the real world, disciplined and methodical, he needs to have everything in order, and has an obsession for detail.*

a. Probability that he is a librarian: (between 0 and 100).
b. Probability that he is a doctor: (between 0 and 100)
c. Probability that he is a pilot: (between 0 and 100)

In this sub-task it is expected that the probability value (of each profession) explicitly stated in the statement (1%) will be identified and the information creating a personality stereotype will be dismissed. The expected assessment value in this sub-task is 0, value obtained from the application of a mathematical formula, where the value chosen by the participant in the professions of doctor and pilot are added and divided by two. This value is then subtracted from the value chosen by the participant in the probability that he is a librarian, because this profession is the one that would match more with the distracting information bias. If a value lower than 0 is obtained, the student is undervaluing, and if a higher value is obtained, he is overvaluing.

Sub-task two is similar to the previous one. It consists in determining the probability between 0 and 100 that a person is an engineer, presenting distracting information relating to personality aspects.

The indication of the subtask is:

Ricardo is a member of a sample where 30% are engineers, and 70% are doctors. He has been chosen at random to be evaluated on his job role. The information available about him is as follows:

> *Ricardo is a thirty-year-old man. He is married, and has no children. He has high skills, is very motivated, and has a very bright future in his field. His colleagues appreciate him very much.*

What is the probability between 0 and 100 that Ricardo is an engineer?

As in the previous sub-task, the person is expected to identify the probability value of the statement (30%), and dismiss the information that generates stereotype. The expected assessment value in this sub-task is also 0, obtained from a mathematical formula where the value chosen by the participant is subtracted from the real value of the exercise. If a value lower than 0 is obtained, the student is undervaluing, and if a greater value is obtained, he is overvaluing.

The confirmation bias is assessed using the hypothesis comparison task. This is presented to the participants using the following statement, which is explicitly written in the used instrument: *Imagine that you need to help to choose people for different jobs. To do this, it is important to use the comparative information to be pretty sure whether a person is actually rebellious (for a creative job), or obedient (for a routine job in which order is very important).*

To solve the task, a list of 22 statements is given for option A (rebellious), option B (obedient), option C (extroverted), and option D (introverted), respectively, where the person chooses only 8 to make the decision. The evaluation of this task implies weighing the situations used to compare the profile (0 points), and not those used to confirm the profile (1 point). A value lower than 16 is therefore expected, given that the information used to compare, and not to confirm, the profile should be chosen. Balanced alternatives between comparison and confirmation are expected to be selected. Therefore, in each option there should not be more than four points, corresponding to the confirmations, giving the whole test (the four options) an ideal value of 16 points or less to explain that there is no confirmation bias. A result of 17 points or more indicates that the confirmation bias is valued over comparison, with the maximum value (four options) being 32 points.

Procedure

A request for written collaboration to the school principals of the three participating universities was used as an ethical consideration mechanism, followed by a request for an interview to clarify doubts and coordinate with the professors who would help to apply the instrument. It was applied during the professor's class time. The instrument considered a written informed consent communicating the participant the objectives of the study and the instrument, and asking him to participate voluntarily and without pressure. Once the consent was signed, the instructions for implementation were given, and the execution time of the instrument was taken, ranging from approximately 15 to 30 minutes.

Descriptive statistics such as central tendency, dispersion, and data distribution measures were used to analyze the data of representativeness and confirmation biases. Due to the fact that a review of the psychometric characteristics of the instrument was necessary, a reliability analysis was made in the sample of participating students, using the Cronbach coefficient to measure the internal consistency of the instrument (Gardner, 2003).

The analysis used descriptive statistics, such as central tendency, dispersion, and distribution statistics (mean, standard deviation, asymmetry, and kurtosis). Task 1 of representativeness bias, both of subtask 1 and subtask 2, was analyzed through distribution in levels, which were defined by quartiles based on the values obtained from the application of the mathematical formula referred to above. The levels were Undervaluation (values less than 0), correct valuation (0 to 2), low overvaluation (3 to 25), high overvaluation (26 to 75), and very high overvaluation (76 and more). Task 2 of the confirmation bias was analyzed through distribution in percentages to see if the results indicated values lower than 16 (without confirmation bias) or higher than 17 (confirmation bias).

Finally, the existence of possible differences between demographic characteristics (age and sex) was analyzed using the Student's t-test, and (university) education characteristics using a one-way ANOVA. In both cases, the effect size was also analyzed. The statistical software Statistical Package for Social Sciences (SPSS) was used to carry out these analyses.

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Results

The reliability analysis of the Cognitive Tasks instrument was calculated using the Cronbach's Alpha based on the typified (standardized) data. The result of the representativeness bias that was evaluated in Task 1 is .609, a value interpreted as average or regular reliability (Hernández et al., 2010) and below the expected level. With respect to the confirmation bias, evaluated in Task 2, the Cronbach alpha obtained is 0.63, which is also interpreted as average or regular reliability and also below the expected level.

At a global level, gathering the set of psychology students in the sample, the values of distribution and dispersion, observed in table 1, show values within normal parameters, judging by the results of asymmetry and kurtosis, which are within the expected according to Bollen and Long (in Núñez-Alonso, Martín-Albo & Navarro, 2007).

In both sub-tasks of the representativeness bias, it is observed a mean greater than the expected result (value 0), as well as a greater dispersion of values in sub-task one than in sub-task two (values far from zero), while in task 2 of the confirmation bias, a high mean (23.9) is found (the expected is a value of 16 or less) to explain that a confirmation bias is not being used.

Table 1

Descriptive values of the instruments

	N	Minimum	Maximum	Mean	S.D.	Asymmetry	Kurtosis
Task 1.1	198	-83	98	28.4	34.4	-.305	.305
Task 1.2	198	-46	70	22.6	24.2	.355	-.501
Task 2	198	4	32	23.9	5.1	-.658	.669

According to the distribution levels established above, in the representativeness bias (sub-task 1), only 17% of the psychology students show a correct valuation according to the parameters of the task; on the other hand, 18% show a low level of overvaluation, 43% exhibit a high level of overvaluation, and 9% a very high overvaluation. Finally, 10% of students undervalue the probability (see Figure 1).

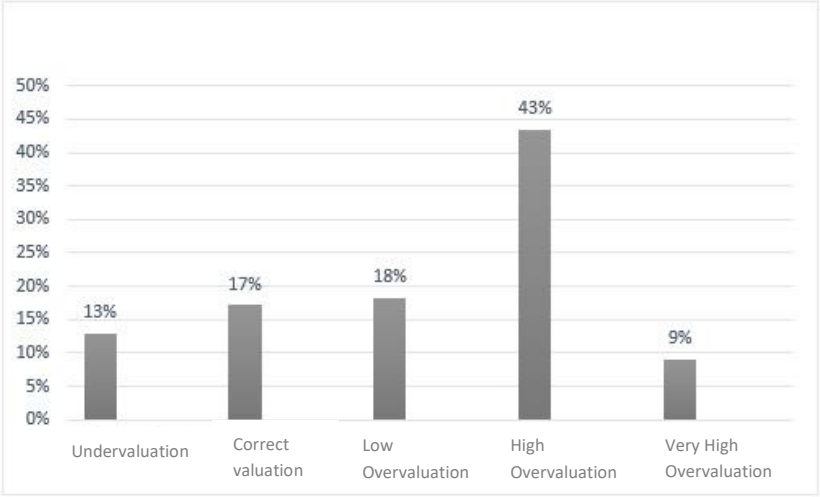

Figure 1. Frequency of responses according to valuation levels in representativeness bias (sub-task 1).

With respect to sub-task two of the representativeness bias, 26% of the students show a correct valuation according to the parameters of the task; on the other hand, 31% show a low overvaluation, while 35% exhibit a high overvaluation; there is no very high overvaluation (0%). Finally, 7% of students undervalue (see Figure 2).

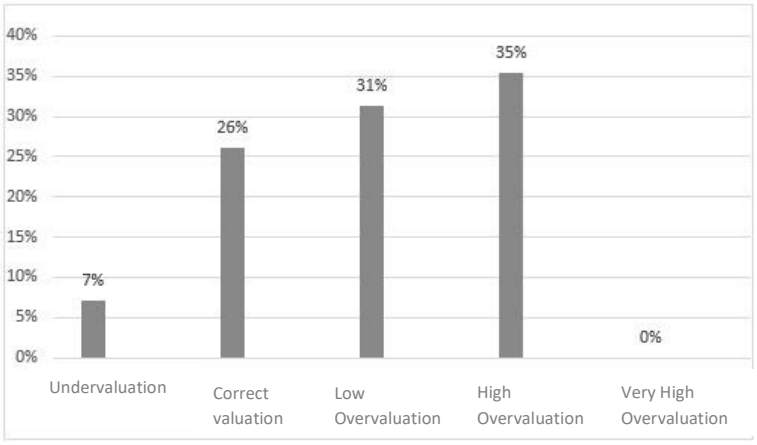

Figure 2. Frequency of responses according to valuation levels in representativeness bias (sub-task 2).

In Task 2 of confirmation bias, it can be seen that only 6% of the sample uses the cognitive comparison mechanism to confirm an idea, selecting questions to compare the information, while 94% of the remaining students tend to look for information that confirms the situation presented (Figure 3).

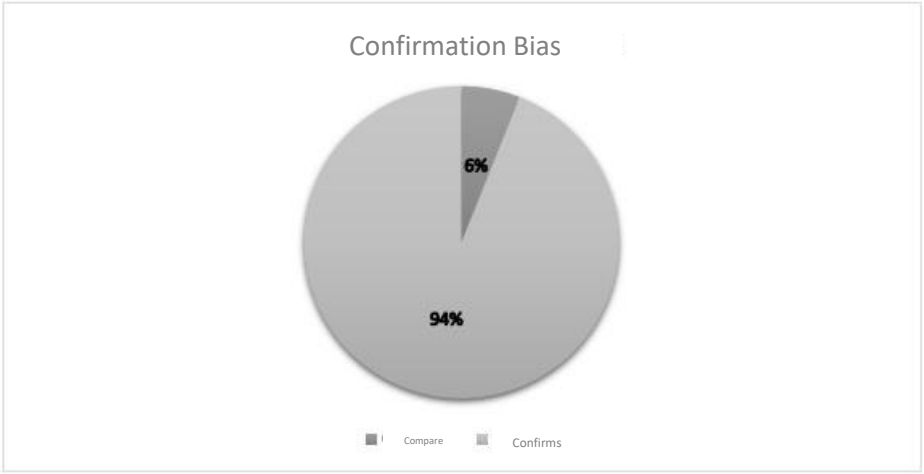

Figure 3. Global results of Confirmation Bias

With respect to the existence of differences in tasks performance, by age, sex, and education, Table 2 shows that the sample shows homoscedasticity in the three variables, which, together with the presumption of normal distribution, would allow the analysis of mean differences to be properly supported through parametric analysis.

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Table 2

Homoscedasticity values in the sample by age, gender, and education

Variable/tasks	F	*p*
Age		
Task 1.1	.644	.423
Task 1.2	1.694	.195
Task 2	.448	.504
Gender		
Task 1.1	.000	.992
Task 1.2	.266	.607
Task 2	.661	.417
Education		
Task 1.1	.786	.457
Task 1.2	2.190	.115
Task 2	.486	.616

The analysis of the t-test indicated in table 3 shows that there are statistically significant differences between the younger age group (younger than 20) and the older age group (older than 21) in sub-task 1.1 (representativeness bias), where the latter has a value closer to 0, which is expected. However, no significant differences were observed in sub-task 1.2 of the representativeness, or in task 2 of the confirmation bias. Likewise, there are no significant differences between female and male genders, in terms of the bias level, with both groups showing a similar level of performance in both tasks.

Table 3

Mean differences by age and gender

	Age ranges							
	20 or younger n=106 (mean [DE])	21 or older n=92 (mean [DE])	t	gl	p	Effect size (d)	LI	LS
Task 1.1	33.29 [33.4]	22.95 [34.9]	2.12	196	.035*	.30	.75	19.92
Task 1.2	23.42 [23.0]	21.66 [25.6]	.510			.07	-5.05	8.57
Task 2	23.91 [4.9]	23.89 [5.3]	.020	196	.611 .984	.00		1.44

				196			-1.41	

* Significant at .05

	Sex							
	Female n=133 (mean [DE])	Male n=65 (mean [DE])	t	gl	p	Effect size (d)	LI	LS
Task 1.1	27.18 [37.4]	31.15 [33.9]	-.76	196	.447	.12	-14.2	6.30
Task 1.2	21.87[29.7]	24.11 [23.3]	-.60	196	.543	.08	-9.4	4.99
Task 2	23.78 [4.9]	24.14 [5.6]	-.46	196	.644	.07	-1.87	1.24

* Significant at .05

Table 4 shows there are significant differences between universities in task 1.1 of the representativeness bias, and in task 2 of the confirmation bias. There are differences in sub-task 1 of the representativeness bias between the Development University and the Bío-Bío University, the latter being where the bias is higher. Similarly, it is observed in the differences of task 2 that the Bío-Bío University has a greater tendency to confirmation than the other two universities.

Table 4

Mean differences between universities

	N	Mean [DE]	F	gl	*p*	Effect size[1]
Task 1.1						
St. Thomas U.	62	27.33 [28.77]				
Bío-Bío U.	82	37.33 [34.0]	6.361	2, 197	.002**	.061
Development University	54	16.49 [37.56]				
Task 1.2						
St. Thomas U.	62	20.53 [21.04]				
Bío-Bío U.	82	25.85 [25.56]	1.27	2, 197	.283	.015
	54	20.06 [25.32]				

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Development University						
	62	22.53 [4.75]				
Task 2						
	82	25.63 [4.62]	8.872	2, 197	.000**	.078
St. Thomas U.						
	54	22.83 [5.43]				
Bío-Bío U.						
Development University						

** significant at .01
1 partial eta-squared

Discussion

As suggested by the studies on the matter (Cortada, 2008; Kahneman et al., 1982; Rodríguez, 2012), it is confirmed the fact that there is a high prevalence of cognitive biases in students which directly influence the fact that decisions are made automatically, often erroneously because they do not collect the relevant or right information. This is evidenced in the results found in this study as it is observed a high number of students with representativeness and confirmation biases, explaining that they are probably naturalized in the participating students.

It is also observed that in task 1 (both sub-tasks), there is a high rate of overvaluation, whether low, high or very high, because most of the students exhibited values higher than zero, which is the correct valuation value. This shows that psychology students would have a deeply-rooted representativeness bias; therefore, they would make decisions based on how much it represents or resembles their previous beliefs, ignoring other useful information, even if explicit (Diaz, Contreras, Batanero & Roa, 2012; Rodriguez, 2012).

Likewise, the confirmation bias, which refers to the tendency to look for or select information that confirms previous hypotheses, being reluctant to information that contradicts them (Muñoz, 2011; Páez et al., 1987), also rates very high in the Task 2 results, with a fairly high percentage of students who would use confirmatory strategies only, and would not value the comparative information, which would mean that the situation is not being fully analyzed, but there is approval as soon as it is observed what it is wanted to see.

Taking into account the above described, it is necessary to point out that the psychology students of the universities in the sample seem to have not yet developed the ability to reason in an effective and unbiased manner. This may be due to multiple factors, such as their educational level within the first three years of education, or each university's orientation in its curricular bases as subjects addressing the explicit development of these abilities are not found in the curricula.

An interesting aspect observed in the results has to do with the few differences found with respect to age. It is observed that only in sub-task 1.1 of representativeness bias, there are significant differences between students older than 21 and those younger, while in task 2.2, and in that of confirmation bias, no significant differences are observed. This would mean that older students are able to respond more effectively (ignoring tendency information) when faced with less evident information than younger students. However, when faced with more explicit information, such as considering an information baseline (30% of engineers in task 2.2), the result is similar between both age groups. The same would occur when it is asked to analyze a job profile through comparison or confirmation, where there would be no differences with respect to age.

The above could be related to two possible hypotheses; the first one is that, thanks to maturity, there would be less risk of bias-based reasoning. The second one would be that the older participants are usually in higher training levels, being the preparation of the institutions that influences the decrease of this task of the representativeness bias.

Although this study did not include a mechanism for comparison of these hypotheses, as it is only exploratory, it would be very interesting to continue with this line of research to determine which of the two possibilities mentioned above is the one that best explains these differences.

Emphasis is also placed on the fact that there is little or no visibility of the reasoning process and that the fact that it is not explicitly evident that these skills are being developed in the universities. This could be related to the implementation of traditional instructional strategies in the university subjects, which is consistent with what is proposed by Terrén (1996), who points out that the cognitive development of students who are immersed in an education characterized by a teaching process that limits autonomous decision-making skills is strongly inhibited.

This is even more relevant when considering that cognitive biases affect decision-making (González et al, 2014; Olmo, 2005; Suárez, 2011). This triggers the need to make visible the importance of this skill in the professional future of the psychologist as responsibilities of great importance fall upon him, especially in decision-making. Therefore, it is important to take into account the prevalence of cognitive biases due primarily to the fact that they work to help others, patients or users. Consequently, the development of specific information-based reasoning should be strengthened in the training of the future psychologists. Likewise, universities should focus on working and developing critical thinking in the students being trained.

Within the limitations presented in this study, as a result of its exploratory design, the limitation of participants and the use of availability sampling, it is considered that the main one is related to the moderate levels of reliability found in the task assessment instruments, which could be secondarily related to the total number of participants in this study. For this reason, it is presumed that the reliability of the "Cognitive Tasks" instrument would have become acceptable or high, perhaps, using a greater number of participants in the sample. Furthermore, having participants from a single region, and not having students of all training levels would also limit the scope of the findings found.

Finally, it is important to point out that this study could be replicated to determine the prevalence of the use of student bias at national level, and to analyze how universities are addressing this facet of the professional development. Likewise, it could undoubtedly be extended to other areas, such as commerce, education, judicial and health areas, because, like the professional activity of psychologists, the aforementioned areas also work to the service of people. Therefore, it is important to make visible the level of cognitive biases in the different professionals in order to be able to exercise the profession more adequately.

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