The Spanish Journal of Psychology (2020), **23**, e16, 1–9.

doi:10.1017/SJP.2020.18

CAMBRIDGE UNIVERSITY PRESS

Influence of Experience on the Thought Process of Clinical Psychologists: An Analysis from the Dual-Process Theories Framework

Ana M. Nieto and María R. Villarejo

Universidad de Salamanca (Spain)

Abstract. In the course of their work, psychologists must make judgments and complex decisions, skills that are part of clinical reasoning. Recent models approach the analysis of such process using the dual-process theories framework. This study provides an assessment of the two systems, System 1 and System 2, in forty-five clinical psychologists with different levels of experience (novices, intermediates and experts) with the purpose of exploring their level of activation and evolution throughout such stages of expertise. According to the results, clinical psychologists mainly activate System 2, $M = 70.91$, $SD = 6.71$, than System 1, $M = 60.49$, $SD = 3.78$; $F_{(1,\ 41)} = 7.99$; $p < .01$; $\eta^2 = .163$, when performing their clinical duties. However, no significant changes have been observed regarding the preferential use of thinking Systems 1 or 2 throughout the experience, both systems are used in a similar way in the different levels of expertise analyzed, with an increase of System 2 at the intermediate level of expertise. The results are analyzed in terms of *intermediate effect* and discussed focusing on the unremitting need for System 2 in psychologist work given the idiosyncratic characteristics of each case requiring treatment in the area of psychology and on the relationship of the two systems in clinical reasoning.

Received 18 February 2019; Revised 23 April 2020; Accepted 28 April 2020

Keywords: clinical reasoning, dual-process theory, intermediate effect, System 1, System 2

The professional work of clinical psychologists involves the assessment and diagnosis of their clients' problems. They are expected to develop and implement the best therapy to ensure a solution, monitoring it to make sure that the improvement is maintained. These tasks are highly complex and multidimensional and, thereby, adequate problem-solving, evaluation and decision-making skills are crucial for treatment success. All of them are part of what is known as *clinical reasoning*.

Several definitions and models have been proposed for clinical reasoning (Patel et al., 2005). A widely accepted definition is that suggested by Barrows and Tamblyn (1980), who describe it as the cognitive process that is required to assess and manage a patient's problems. Clinical reasoning has been extensively studied in health professionals (Higgs et al., 2008), especially physicians, and more recently, the scope has been extended to other clinical areas. Thus, research is also conducted on how nurses (Hutchinson et al., 2018; Thirsk et al., 2014), occupational therapists and psychologists (Carrier et al., 2010; Flores et al., 2014) make judgments and decisions.

There is fairly broad consensus (e.g. Eva, 2005; Norman et al., 2007; Schmidt et al., 1990) in assuming that it is a complex process that involves analytic and non-analytic cognitive processes. Its development is associated with problem-solving skills and the need to make judgments and decisions on what the client's problem is and how to best address it. This requires skills for the identification and recognition of symptoms, for the preparation of diagnostic hypotheses and for information gathering and its use to draw deductions; all of this to reach a diagnosis and thus choose a possible treatment that, in the case of psychology, involves further information gathering that will allow the formulation and testing of the different therapeutic alternatives.

Various models have been suggested to explain how clinicians approach patients in their professional practice (Patel et al., 2005). In psychology, probably influenced by medicine, the most widespread model for the analysis of clinical reasoning is the *hypothetico-deductive*

Correspondence concerning this article should be addressed to Ana M. Nieto. Departamento de Psicología Básica, Psicobiología, y Metodología de las Ciencias de Comportamiento de la Universidad de Salamanca. Av. De la Merced, 109. 37008 Salamanca (Spain).

E-mail: acarracedo@usal.es.

Funding Statement:This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

How to cite this article:
Nieto, A. M., & Villarejo, M. R. (2020). Influence of experience on the thought process of clinical psychologists: An analysis from the dual-process theories framework. *The Spanish Journal of Psychology*, *23*. e16. Doi:10.1017/SJP.2020.18

model. This form of clinical evaluation has also received other names such as backwards reasoning, hypothesis driven (Patel et al., 2005) or *analytical reasoning* (Norman et al., 2007). Regardless of its label, the idea is that this process involves the generation of hypotheses that can explain the clinical case and a search for and analysis of evidence that may prove the hypothesis true.

Alongside the analytical processing underlying the hypothetico-deductive model, in other disciplines such as medicine, it has been noted that clinicians also produce diagnoses based on automatic rather than analytic processes (e.g. Mamede et al., 2007; Norman, 2005; Norman et al., 2007). In this case, diagnosis would be reached after a process of recognition of similarities, matching the case to be diagnosed with similar ones previously stored in memory, producing a *pattern recognition based* diagnosis in a relatively quick and unconscious manner. This model allows clinicians to observe and recognize patients' symptoms without the need to engage in the whole process of hypothesis-building, search for information and reasoning to test such hypothesis. This diagnostic model has been called *non-analytical reasoning*.

The use of one or another model seems to depend on several factors, one of the most important being *clinical experience* level, albeit mediated by certain of the case's characteristics, such as difficulty (Mamede et al., 2007), degree of similarity or typicality (Kulatunga-Moruzi et al., 2001). While there is general evidence that (Norman et al., 2007) clinicians with greater expertise tend to use non-analytical reasoning when addressing simple or routine cases, complex problems would require the activation of analytical reasoning (Norman, 2005). The greater tendency of expert clinicians to use non-analytical reasoning has been explained (Schmidt & Boshuizen, 1993) on the basis of a process of knowledge restructuring that is acquired over the years of clinical experience and that has been called *knowledge encapsulation.* Thus, knowledge is gradually "encapsulated" into diagrams or *scripts* of disorders and patients that can be used as a basis to make the identification and recognition of new cases easier.

Becoming an expert (Patel et al., 2005) requires continued, long-term and rigorous training. Yet, this ongoing training does not mean "continuous progress" in the development of the processes involved in practice, since there is evidence of drops in such progression. It is the so-called *intermediate effect*, which shows a non-linear development (U-shaped) of practice. It is a period within the process of specialization where, against what could be expected, there is no progress in the quality of performance. Thus, the reasoning process of intermediate professionals suffers a decline when compared to that of their novice or already expert colleagues. This shows in a variety of aspects (Patel & Groen, 1991; Schmidt et al., 1990), for example, in the making of a larger number of irrelevant associations, more wrong assumptions, or the remembering of a greater array of insignificant concepts. Meanwhile, experts produce their diagnoses by processing really meaningful information and are faster in coming up with a diagnosis. Nevertheless, it is important to note that such detriment in the quality of reasoning does not entail more inaccurate diagnoses. Intermediates make diagnoses that are as precise as those of their expert colleagues. The intermediate effect has been observed in the processes that underlie diagnosis but not in the final result. In other words, in the *increase in reflection* or the thinking that takes place before the diagnosis. This effect has been attributed (Patel et al., 2005; Patel & Groen, 1991) to the fact that intermediates, although they have already acquired extensive knowledge, have not yet functionally reorganized it. Intermediate expertise is structured as a network that leads to extensive search, which hinders fast coding and selective retrieval of information.

Over the last decade, a new approach to the analysis of clinical reasoning is gaining momentum: the dual-process theories (e.g. Croskerry, 2009; Marcum, 2012; Pelaccia et al., 2011). Its theories about the cognition (e.g. Evans & Frankish, 2009; Hogarth, 2002; Kahneman, 2011; Stanovich, 2011) claim that people are equipped with a double processing system, so that when approaching a problem, they can either do so using an automatic, fast, intuitive, effortless system, called System 1; or engaging in an analytical, reflective, slow and strenuous process, called System 2. The activation of one and/or the other is not clearly defined. For example, Kahneman (2011) defends the prevalence of System 1, while others, such as Epstein (2014) or Hogarth (2002) suggest that both systems would be involved in every task. Still, individuals would favor one over the other depending on the situation. For example, System 2 would predominate in complex, ambiguous, unforeseeable and poorly defined tasks.

Within the dual-process theories framework, clinical reasoning through non-analytical processing based on pattern recognition would correspond to System 1, while deductive clinical reasoning using the analytical processing that underlies the hypothetico-deductive process would correspond to System 2.

Dual-process theories have introduced a very useful framework for understanding and analyzing clinical reasoning and some of its peculiarities. Balla et al. (2009) have recently proved the suitability of this for the analysis and understanding of clinical reasoning. However, there are not many studies devoted to the analysis of the level of involvement of these two cognitive systems in clinicians with different years of experience. This study presents research carried out with clinical psychologists who had been exercising their profession for different lengths of time, with the general

https://doi.org/10.1017/SJP.2020.18 Published online by Cambridge University Press

purpose of analyzing the influence of such clinical experience on their thought processes and to explore the degree of participation of each of the processing systems, System 1 and System 2, in the different levels of expertise.

Specifically, the aims were:

1. To analyze the degree of intervention of thought Systems 1 and 2 in clinical psychologists with different levels of experience.
2. To establish whether the number of years of clinical experience lead to changes in the prevalence of one thought system over the other.

These goals have been achieved through an empirical study using a sample made up of novice, intermediate and expert psychologists, assessing the degree of involvement of each system according to the mentioned levels of expertise.

If the results obtained for physicians on the differences in the use of the analytical and non-analytical systems according to clinical experience are similarly applied to psychologist, and the framework of dual-process theories is used, the resulting assumption would be that the most experienced psychologists, those who have already built solid knowledge structures or scripts that facilitate recognition and matching of the case at stake with those stored in memory, would show a greater tendency to use System 1, while the most novice, who have not yet had the chance to developed such knowledge structures, would be more prone to reflection and, therefore, to use System 2. On their part, intermediate-level psychologists, who, although already in possession of significant knowledge, have not yet developed the scripts nor organized knowledge diagrams, also show a greater tendency to reflection, even higher than that of novices, also scoring higher in System 2.

More specifically, our hypotheses are the following:

1. Given the idiosyncrasy of the cases that they must deal with in their practice, clinical psychologists have a stronger tendency towards reflective thinking against intuitive or experiential thought, that is, to System 2 rather that to System 1.
2. If years of experience contribute to the acquisition and organization of knowledge and to the generation of a type of encapsulated knowledge that favors non-analytical judgments, that is, the use of System 1, there will be differences in the use of the two thought systems according to the number of years of clinical practice. In fact, we expected novice psychologists to show a greater tendency to use System 2, since they have not yet developed a useful knowledge structure that may favor the use of System 1; intermediates would show a greater tendency towards reflection or System 2, since, as can be observed from the intermediate effect, professionals with intermediate-level expertise, albeit having vast amounts of knowledge, do not yet have it organized or structured, which leads to more analyses, searches and reflections, that is, a greater use of System 2; but expert psychologists would tend to use more often System 1, since they already have the scripts that help to make diagnoses and decide on treatments easily.

To test these hypotheses, we have carried out a study with psychologists with different levels of expertise (novices, intermediates and experts) and we have assessed their thought systems using the Rational-Experiential Inventory (REI) (Pacini & Epstein, 1999). Thus, the *dependent variable* was psychologists' scores on such inventory (System 1 or Experiential and System 2 or Rational), while the two *independent variables* were the *intergroup* variable and the *intragroup* variable. The intergroup variable corresponds to the years of professional experience, defining three levels: (1) Little experience; (2) average experience; (3) high experience. On the other hand, the intragroup variable involves styles of thought: experiential thinking (System 1) and rational thinking (System 2).

Method

Sample

The study was conducted using non-probability or incidental sampling. Individuals were selected directly and intentionally from an easily accessible population group, all of them psychologists whose participation in the study was voluntary. They all worked in the Spanish public healthcare system assessing and treating various and diverse mental health problems, as is the duty of clinical psychologists in Spain. This ensured a higher probability of their operating under the same working conditions in terms of number and type of treated cases. Psychologists working in the private sector were not included in the study.

The total number of participants was 45 psychologists. The sample consisted of clinical psychologists divided into three groups according to their years of clinical practice experience: Novice, intermediate and expert. The age range was fixed between 25 and 74 years of age, the average being 45.42. Most of the individuals in the sample were women (38 women and 7 men), as is usually the case in this profession, and distributed in the three group as follows: The first group -novice group- comprised 15 psychologists (14 women and 1 man) whose years of experienced ranged between 1 and 9. The second group -intermediate group- consisted of 15 psychologists (10 women and 5 men) whose experience range was between 10 and 29 years of clinical practice. And the third and last, expert group, was

https://doi.org/10.1017/SJP.2020.18 Published online by Cambridge University Press

composed of psychologists (14 women and 1 man) with over 30 years of clinical work experience, the maximum number of years accumulated by an individual being 36. Although the number of cases in each group was identical, the distribution by gender was not, with the majority of men (71.4%) being in the intermediate group while in the other two there were the 14.3%.

Materials

The study was conducted using the *Rational–Experiential Inventory* (REI) (Pacini & Epstein, 1999), designed to be answered online through the docs.google application. It is a self-report inventory aimed at the assessment of the two modes of thinking: Rational and experiential, represented by Systems 1 and 2, respectively.

The scale's reliability is high (Rational Scale, α = .90; Experiential Scale, α = .87). The REI consists of 40 items, 20 for each thinking mode. Answers are based on a 5-point Likert scale where subjects were to choose the number that best fit their level of agreement or disagreement with each of the questions or assertions contained in the inventory in relation to their approach to everyday clinical practice, 1 being '*strongly agree*' and 5 '*strongly disagree*'.

Procedure

First, an online version using the docs.google app was produced and used in a pilot study involving six people in different age ranges and of different genders, to test whether the format was adequate and whether the instructions and items were easy to understand. After analyzing such version and checking that it had been understood correctly, the final version was prepared.

Data collection took place between February 2016 and March 2016. The sample was obtained from different Mental Health Complex. After getting in touch with one of the psychologists to inform her about the study's purpose, the information document clarifying its aim was sent, together with a copy of the inventory to be answered by the psychologists. Thus, the request for the clinical psychologists' collaboration to study their thinking mode according to their years of professional experience was made via email and other technological platforms (telephone, Skype, WhatsApp). Participation was always voluntary. Once they had agreed to collaborate, the psychologists were informed that all answers would remain anonymous. Likewise, when there was direct contact, they were also informed of confidentiality. Finally, they were thanked for their collaboration and asked for their help to disseminate it among fellow professionals.

Results

The analyses were carried out using IBM SPSS Statistics 25.00 software. Inter-intra factor ANOVA was used to assess whether there were significant differences between psychologists' thinking in their approach to work according to their years of experience. Years of experience were taken as the intergroup variable: "Novices", "intermediates" and "experts". And the intragroup measurement was the use of thinking systems: System 1 (experiential thought) and System 2 (rational thought).

Before the analysis, the Kolmogorov-Smirnov test was conducted to explore data quality in terms of normality, according to which, all the data met the assumption of normality, meaning that they were normally distributed. Besides, the analysis of the assumption of homoscedasticity using Levene's test proved that all the variables were homogeneous, meaning that the assumption of homoscedasticity was also fulfilled.

The sample consisted of 45 clinical psychologists, 38 women and 7 men. Before conducting the inter-intra ANOVA, we decided to explore the possible differences between men and women psychologists' systems to determine whether there were any gender-related differences in the use of the systems. This was conducted by comparing the means obtained in System 1 and System 2 by female and male clinical psychologists.

Table 1 shows such means and the standard deviation obtained for men and women's uses of Systems 1 and 2. Regarding System 1, the means obtained by men (M = 62.14, SD = 3.84) and those obtained by women (M = 60.18, SD = 3.74) are very similar, while in the case of System 2, men score quite higher (M = 77, SD = 5.71) than women (M = 69.79, SD = 6.33). An independent samples t-test showed that these differences between men and women's use of System 2 were statistically significant, $t_{(43)} = 2.80$; $p < .01$, whereas the difference in their use of System 1 or experiential was not, $t_{(43)} = 1.26$; $p = .21$. Therefore, the gender variable appeared as correlated with a preferential use of System 2, with men yielding the highest levels in its use. Given the importance of gender in the preferential use of the Systems, we carried out the inter-intra ANOVA introducing the gender as a *covariate*. The interaction Systems*Gender was not significant statistically $\left[F_{(1,41)} = 1.08; p = .30; \eta^2 = .03\right]$, so when this effect was controlled, there would be not

Table 1. *Means, Standard deviations on the Two Systems in Women and Men Psychologist*

	Women (n = 38)	Men (n = 7)	t
	M (SD)	M (SD)	
System 1	60.18 (3.74)	62.14 (3.84)	1.26
System 2	69.79 (6.33)	77.00 (5.71)	2.80***

Note. n = number of cases; M = mean; SD = standard deviation; t test.

*** $p < .001$

https://doi.org/10.1017/SJP.2020.18 Published online by Cambridge University Press

Table 2. *Means on the Two Systems in Novice, Intermediate and Experts Psychologist*

	n	System 1 *M* (*SD*)	System 2 *M* (*SD*)	*t*/F
Novice	15	61.20 (3.36)	68.87 (7.68)	3.89**
Intermediates	15	61.00 (3.83)	75.00 (5.31)	7.94***
Experts	15	59.27 (4.06)	68.87 (5.26)	5.60***
Total	45	60.49 (3.78)	70.91 (6.71)	7.99**

Note. *n* = number of cases; *M* = mean; *SD* = standard deviation; *t*/*F* = tests.

*$p < .05$, **$p < .01$. ***$p < .001$.

significant differences between gender in the use of the Systems. Table 2 shows the means and standard deviations for each of the three experience groups in System 1 and System 2.

The hypothesis of psychologists' greater tendency to use System 2 over System 1 when performing their duties is tested, the context and clinical performance being dominated by rational rather than by intuitive thought. We can see in Table 2 how the mean for System 2 (M = 70.91, SD = 6.71) is higher than that for System 1 (M = 60.49, SD = 3.78). The results of intra-factor ANOVA $\left[F_{(1,41)} = 7.99; p < .01; \eta^2 = .163\right]$ confirmed the significance of such difference. Therefore, in psychologists' approach to their clinical tasks, the rational usually prevails over the intuitive or experiential thinking. Whether such prevalence in the use of System 2 over System 1 could be observed in psychologists within each level of experience or, on the contrary, only appeared within certain age ranges was examined by carrying out *intra* comparisons for each level of expertise using Paired Samples *t*- tests. As shown in Table 2, already from their early years of work, clinical psychologists make greater use of System 2 (M = 68.87; SD = 7.6) than of System 1 (M = 61.20; SD = 3.36). Those in the intermediate level also displayed a greater tendency to use System 2 (M = 75; SD = 5.31) over System 1 (M = 61; SD = 3.83). Again, the expert level group showed the same trend, meaning a clear preference towards System 2 (M = 68.87; SD = 5.26) above System 1 (M = 59.27; SD = 4.06). All these differences in means were statistically significant. Therefore, regardless of their years of experience, clinical psychologists make greater use of System 2, which means that the reflective system seems to prevail when they are performing their professional duties.

The second hypothesis is an attempt at finding out whether the number of years of clinical psychology experience entails changes in the use of the two systems. Specifically, our prediction was that, against the prevalence of reflection and the use of System 2 during the first years of clinical practice, as years of experience are accumulated, System 1 would increase and become more used, going through an intermediate stage of experience that would also be characterized by a high use of System 2. Figure 1 shows the graphic representation of the means that correspond to System 1 and to System 2 obtained for each experience group. As mentioned, System 2 means for all three groups (Novices mean = 68.87; Intermediates mean = 75; Experts mean = 68.87) were above those of System 1 (Novices mean = 61.20; Intermediates mean = 61; Experts mean= 59.27), which reflects a higher predominance of reflection and reasoning in clinical psychologists. Likewise, it can be observed that System 2 or rational thinking spikes in the intermediate experience group (M = 75), while means obtained for novices (M = 68.87) and experts (M = 68.87) are practically identical. This shows that the intermediate experience group is the one whose tendency towards reflection is greater, to, after a few years, go back to the initial stage. Thus, psychologists with an intermediate level of experience seem to be the ones with a greater tendency towards reflection and deliberation, to a greater extent than novices or experts. As regards System 1, its use proves to be quite stable, with very similar means in all three levels of experience. Against our assumption, there was no noticeable increase in the use of System 1 in the most experienced group that could suggest a greater use of the intuitive system, as a reflection of accumulated expertise and well-organized knowledge, when producing diagnoses and delivering psychological treatment. Rather, the mean obtained for experts in System 1 was even slightly lower than that registered for the other two levels of expertise. In all three groups, the mean for System 1 was below that obtained for System 2. After this descriptive interpretation of the means obtained, ANOVA determined that interaction was not statistically significant $\left[F_{(2,41)} = 2.09; p = .13; \eta^2 = .09\right]$, which indicates that, in this sample at least, years of clinical experience do not lead to changes in priority regarding the use of one or the other modes of thought. Therefore, this hypothesis could not be statistically proved.

Discussion

The main purpose of this study was to provide a global analysis of clinical psychologists' tendency to use thought Systems 1 or 2 according to their levels of clinical experience, and to explore possible changes in these Systems as they progress through different levels of expertise.

In general, the results show that, clinical psychologists, regardless of their level of expertise, state that they mainly use System 2, so that the reflective system is the one that dominates the professional performance of this specific sample. And secondly, years of experience did

https://doi.org/10.1017/SJP.2020.18 Published online by Cambridge University Press

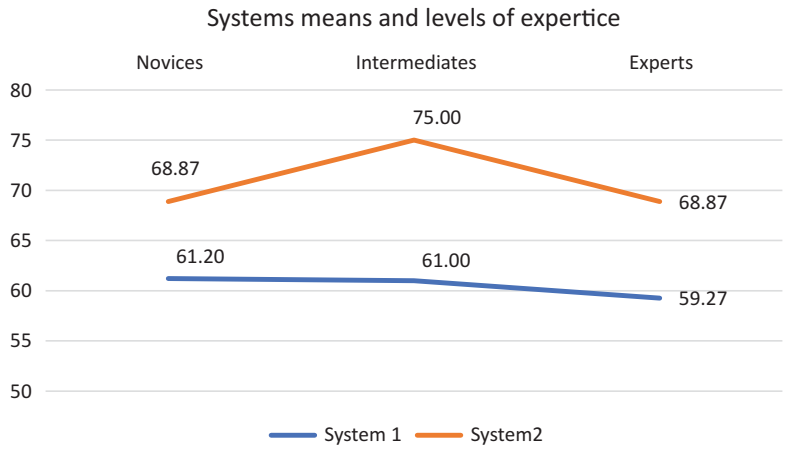

Figure 1. Graphic of the System 1 and System 2 Means Scored by Clinical Psychologists according to Years of Experience.

not yield statistically significant differences in the preferential use of System 1 by experts or System 2 by novices and intermediates, despite the spike in intermediates' use of System 2. Psychologists claim to use both thought systems similarly regardless of their experience, although there is a clear dominance of System 2 over System 1 that is particularly noticeable in the intermediate group. We will now discuss these results.

Our first hypothesis based on the assumption that clinical psychologists would be more prone to use System 2, regardless of their level of experience, has been proved and demonstrated for the different experience groups. Novice, intermediate and expert clinical psychologists make greater use of the rational system. Therefore, the basis of clinical thinking is not experiential, intuitive or System 1, as is usually the case in everyday situations (Kahneman, 2011), but this context of solving and addressing clinical cases that require high measures of analysis, reflection and reasoning entails a stronger activation of System 2. Thus, System 2 is more active that System 1 in clinical psychologists, that is, analytical processing is stronger than intuitive processing. We suppose that the big idiosyncrasy, the broad variability and complexity of cases awaiting diagnosis, treatment and monitoring requires clinicians to be alert, which makes a System 1 baseline cognitive status unlikely. All this without underestimating the need, importance and contribution of System 1, which is crucial for the performance of System 2 in the sense that the latter seems to work on the former's contributions. In brief, given the nature of the cases to be assessed, the need for producing diagnoses and delivering treatment based on functional analyses that depend on educational, behavioral, cognitive, emotional, etc., variables that differ widely from one patient's history to another, and the need for long-term monitoring, clinical reasoning in psychology involves large measures of System 2, which prevails over System 1 at all levels of experience. Indeed, this could be a relevant difference regarding the clinical reasoning observed in other specializations, such as medicine, where the simplest everyday cases can be solved automatically rather than analytically, with no need for engaging in a whole process of comprehensive data collection and tests to formulate possible hypotheses. The particularity of the cases addressed in the area of psychology reduces the chances of being able to activate Type 1 processes more often, i.e. issuing diagnoses based on automatic rather than analytic processes.

In our second hypothesis, we proposed that experience led to changes in the use of the two systems. The assumption was that expert psychologists would show an increase in System 1 and a greater inclination to use this experiential or intuitive system, while System 2 would be more active in novices and intermediates. With regard to intermediates, despite the fact that they would have already acquired a vast amount of knowledge, lack of efficiency in its organization would also lead to high doses of reflection. Nonetheless, this is not what has been observed. ANOVA proved that interaction was not significant, so that no significant changes in the systems were observed according to experience. Experience does not generate significant changes in the use of the two thought systems. In other words, the sample studied yielded very similar uses in thinking modes 1 and 2 along the different levels of experience. Accordingly, accumulation of knowledge and its organization in a more efficient way has no impact, as could have been expected, on a lower use of reflection and a greater tendency to use intuition. System 2 seems to be the one that is primarily activated by psychologists, regardless of their experience. Especially relevant is the increase in the use of System 2 by the intermediate experience level group. This last result is consistent with what has been observed in other clinical areas, it is a significant increase in reasoning and reflection in

https://doi.org/10.1017/SJP.2020.18 Published online by Cambridge University Press

professionals with intermediate expertise and has given way to the phenomenon known as the *intermediate effect*, which is caused by the fact that, although intermediates have already acquired extensive knowledge, they have not yet functionally reorganized it. It is structured as a network that leads to extensive search, while experts have hierarchically arranged scripts that make fast filtering of irrelevant information easier and novices still do not have enough information to engage in complex searches. Schmidt and Boshuizen (1993) also point out that, while intermediates have many pieces of knowledge, they lack the interconnectivity that characterizes expert knowledge, which leads them to become involved in unnecessary searches. This translates into a greater tendency towards reflection and digression, and this is what has been observed in the sample of intermediate psychologists, who are the ones to show greater activation in such System 2. Nevertheless, it is important to stress that this trend towards greater reflection does not entail less precise diagnoses, these professionals are as effective as their more experienced colleagues (Patel et al., 2005; Schmidt et al., 1990).

On the other hand, System 1 remains much the same across the different levels of expertise, yielding very similar means for novices, intermediates and experts, which is why there have been no increases in its usage by experts, as we had predicted. In principle, these results do not seem to match the general trend observed in other professionals, where results show a greater use of non-analytical thought or System 1 by expert physicians (Schmidt & Boshuizen, 1993; Schmidt et al., 1990). Nevertheless, they would be consistent if we were to take into account that such tendency for experts to use System 1 is not a general trend, but is mediated by certain case characteristics, especially when the cases to address were easy. When cases were complex, experts used analytical reasoning or System 2 to the same extent as novices (Mamede et al., 2007). Kulatunga-Moruzi et al. (2001) also found differences between the use of analytical and non-analytical thought according to the type of case the physicians were faced with. In this regard, the use of System 1 or System 2 would not only depend on experience, but also on the case or problem that is being addressed. Results would agree with the dual-process theories that suggest that the switch from one system to the other depends on certain of the situation's characteristics such as newness, difficulty, lack of time for its resolution, etc. (e.g. Epstein, 2014; Evans, 2012; Hogarth, 2002; Kahneman, 2011).

In summary, cognitive processing in the field of psychology seems to be different from that of other health disciplines. The use of analytical-functional procedures, together with formulations that guide the intervention and its follow-up, may condition the preferential use of System 2, independently of the level of experience, and more accentuated in professionals with an intermediate level of experience. Possibly, the need to individualize the treatment does not allow the use of cognitive heuristics, more typical of System 1, and perhaps possible in other health disciplines.

It must be noted that the methodology used here is different from the one in the mentioned studies. Those required case-solving and ours a self-report on reasoning, which precludes identical matching. The fact that it is personal assessment produced by psychologists themselves on their use of Systems 1 and 2 could lead clinicians to believe that they use System 2 more often, since this processing mode involves awareness, while the use of System 1 is fast, automatic and not always conscious, which could result in an overvaluation of System 2.

Even if there is no evidence to support this second hypothesis, attention should be drawn to how System 1 scores remain stable in professionals with different years of experience, which could hint at the importance of and need for this System. According to this study, *there is nothing to suggest that an increase in the use of one of the two systems entails a decrease in the use of the other*. This proves that both systems are active in clinical performance, contributing to clinical decision-making. The literature duly recognizes (e.g. Norman et al., 1999; Norman & Eva, 2010) that clinical diagnoses are more effective when both processing modes, analytical and non-analytical, are involved. The use of only one of them is attached to poorer clinical performance. Eva (2005), for example, also notes that both processing strategies invariably contribute to the final decision, both in the case of novices and in that of experts. Although, as stated by Kulatunga-Moruzi et al. (2001) there is a probability that a change towards a non-analytical strategy could take place, both processes play a crucial role in clinical performance, making it difficult to identify which of them each clinician uses the most when working. Nevertheless, as observed, the use of the systems probably depends too, and in an important manner, on the type of case that is being addressed (familiar, rare, difficult, etc.).

Finally, by way of conclusion and reflection, it should be noted that the involvement of both systems in clinical judgment is quite widely accepted, even if how they participate is not so clear. How do these systems work? They could work in an exclusionary or non-exclusionary manner, simultaneously or sequentially. To date they have been proved to be non-exclusive, since both play a role in clinical reasoning. This is also supported by certain authors (Epstein, 2014; Pelaccia et al., 2011), who state that the activation of one does not necessarily entail the disconnection of the other, which is also what our results suggest: *Both are active and increases in the use of one system do not mean decreases in the use of the other*. And as to whether they work simultaneously or sequentially,

https://doi.org/10.1017/SJP.2020.18 Published online by Cambridge University Press

Kulatunga-Moruzi et al. (2001) note that both systems might operate concurrently and contribute to clinical judgment. However, we speculate that they probably operate on a *complementary* basis, in the sense that the product of one of them will be used by the other. Suggesting that they complement each other goes beyond the assertion that they are neither exclusive nor excluding; what we intend to convey is that the work carried out by each of the systems could be conditioned and facilitated by the work of the other, and that better cognitive results are achieved when both are involved. Along these lines, Neufeld et al. (1981) proved the importance of intuition and first impressions obtained from the first minutes spent with a patient to reach a good diagnosis. On the other hand, the role played by System 2 in correcting System 1 is widely acknowledged (Kahneman, 2011), so that good technical strategies that may polish and refine those first impressions are crucial for successful diagnosis and treatment. In any case, this form of relationship still requires in-depth study and the collection of further evidence.

In this study, dual-process theories have been used as a theoretical model of cognition within the clinical process, and psychologists with different levels of expertise have been assessed to analyze and explore how both systems would work. We believe our research is innovative in several ways. First, to improve clinical practice it is very important to know how psychologist think (Wilcox & Schroeder, 2015). Second, there are not many studies on the analysis of cognitive processes in clinical psychologists with different levels of expertise, which is what we have conducted in this study by comparing the performance of novices and experts, adding the category of intermediates, to check their cognitive expressions. On the other hand, dual-process theories have provided a particularly useful framework for the understanding of cognition, which has allowed us to observe how the systems operate along the different levels of expertise.

Nevertheless, this work has its limitations, the main being the use of self-report to measure the systems, asking subjects themselves about how the working of their cognition may be expressing a certain social desirability. Likewise, it could be the case, using such methodology, that subjects are unaware of their own processes, especially in the case of System 1, which is, by nature, unconscious. It would have been more rigorous to measure the role of each of the systems, but for the time being, and as a first approach, we believe that our data are revealing, and we will not cease to plan future research to improve these weaknesses. Sample size could have been larger; however, we all know that it is often difficult to access the sample, and even more so to find psychologists that fit in the different experience categories. The small number of men in the sample and it distribution was not similar among the different levels of experience, with most men being at the intermediate level. This fact could apparently be explaining the higher activation of System 2 observed in the intermediate group. However, this interpretation has been disregarded since we have controlled the gender influence by introduction it as a covariate in the inter-intra ANOVA. Therefore, we consider that the activation observed in System 2 by the intermediate group could not be attributed to the greater presence of males in that group since it effect has been controlled. Another limitation, apart from REI, it would have also been useful to perform a further measurement that might reveal information concerning other metacognition or personality aspects, for example. These are some of its limitations, though, possibly, not the only ones.

Additionally, we believe that this study has raised new questions that should be addressed in the future. One of them is the gender-related difference observed in the use of the two systems by male and female psychologists. It would be interesting to use a much larger sample to be able to accurately define the extent to which gender is a variable related to the use of Process 1 and Process 2, both in the clinical and in other contexts. Another challenging topic for research and corroboration using another methodology are the differences in clinical reasoning that may arise among different healthcare areas. These are only a few of the questions that have arisen, and they will, no doubt, be the object of future research.

References

Balla, J. I., Heneghan, C., Glasziou, P., Thompson, M., & Balla, M. E. (2009). A model for reflection for good clinical practice: Model for reflection on practice. *Journal of Evaluation in Clinical Practice*, *15*(6), 964–969. https://doi.org/10.1111/j.1365-2753.2009.01243.x

Barrows, H. S., & Tamblyn, R. M. (1980). *Problem-based learning: An approach to medical education*. Springer Publishing Company.

Carrier, A., Levasseur, M., Bédard, D., & Desrosiers, J. (2010). Community occupational therapists' clinical reasoning: Identifying tacit knowledge. *Australian Occupational Therapy Journal*, *57*(6), 356–365. https://doi.org/10.1111/j.1440-1630.2010.00875.x

Croskerry, P. (2009). Clinical cognition and diagnostic error: Applications of a dual process model of reasoning. *Advances in Health Sciences Education*, *14*(Suppl. 1), 27–35. https://doi.org/10.1007/s10459-009-9182-2

Epstein, S. (2014). *Cognitive-Experiential Theory: An integrative theory of personality*. OUP USA.

Eva, K. W. (2005). What every teacher needs to know about clinical reasoning. *Medical Education*, *39*(1), 98–106. https://doi.org/10.1111/j.1365-2929.2004.01972.x

Evans, J. S. B. T. (2012). Spot the difference: Distinguishing between two kinds of processing. *Mind & Society*, *11*(1), 121–131. https://doi.org/10.1007/s11299-012-0104-2

https://doi.org/10.1017/SJP.2020.18 Published online by Cambridge University Press

Evans, J. S. B. T., & Frankish, K. (2009). *In two minds: Dual processes and beyond*. Oxford University Press.

Flores, A., Cobos, P. L., López, F. J., & Godoy, A. (2014). Detecting fast, online reasoning processes in clinical decision making. *Psychological Assessment*, *26*(2), 660–665. https://doi.org/10.1037/a0035151

Higgs, J., Jones, M. A., Loftus, S., & Christensen, N. (2008). *Clinical reasoning in the health professions*. Elsevier Health Sciences.

Hogarth, R. M. (2002). *Deciding analytically or trusting your intuition? The advantages and disadvantages of analytic and intuitive thought.* UPF Economics and Business Working Paper No. 654. http://doi.org/10.2139/ssrn.394920

Hutchinson, M., Hurley, J., Kozlowski, D., & Whitehair, L. (2018). The use of emotional intelligence capabilities in clinical reasoning and decision-making: A qualitative, exploratory study. *Journal of Clinical Nursing*, *27*(3–4), e600–e610. https://doi.org/10.1111/jocn.14106

Kahneman, D. (2011). *Thinking fast and slow*. Farrar, Straus & Giroux.

Kulatunga-Moruzi, C., Brooks, L. R., & Norman, G. R. (2001). Coordination of analytic and similarity-based processing strategies and expertise in dermatological diagnosis. *Teaching and Learning in Medicine*, *13*(2), 110–116. https://doi.org/10.1207/S15328015TLM1302_6

Mamede, S., Schmidt, H. G., Rikers, R. M. J. P., Penaforte, J. C., & Coelho-Filho, J. M. (2007). Breaking down automaticity: Case ambiguity and the shift to reflective approaches in clinical reasoning. *Medical Education*, *41*(12), 1185–1192. https://doi.org/10.1111/j.1365-2923.2007.02921.x

Marcum, J. A. (2012). An integrated model of clinical reasoning: Dual-process theory of cognition and metacognition: Integrated model of clinical reasoning. *Journal of Evaluation in Clinical Practice*, *18*(5), 954–961. https://doi.org/10.1111/j.1365-2753.2012.01900.x

Neufeld, V. R., Norman, G. R., Feightner, J. W., & Barrows, H. S. (1981). Clinical problem-solving by medical students: A cross-sectional and longitudinal analysis. *Medical Education*, *15*(5), 315–322. https://doi.org/10.1111/j.1365-2923.1981.tb02495.x

Norman, G. (2005). Research in clinical reasoning: Past history and current trends. *Medical Education*, *39*(4), 418–427. https://doi.org/10.1111/j.1365-2929.2005.02127.x

Norman, G. R., Brooks, L. R., Colle, C. L., & Hatala, R. M. (1999). The benefit of diagnostic hypotheses in clinical reasoning: Experimental study of an instructional intervention for forward and backward reasoning. *Cognition and Instruction*, *17*(4), 433–448. https://doi.org/10.1207/S1532690XCI1704_3

Norman, G. R., & Eva, K. W. (2010). Diagnostic error and clinical reasoning. *Medical Education*, *44*(1), 94–100. https://doi.org/10.1111/j.1365-2923.2009.03507.x

Norman, G., Young, M. E., & Brooks, L. (2007). Non-analytical models of clinical reasoning: The role of experience. *Medical Education*, *41*(12), 1140–1145. http://doi.org/10.1111/j.1365-2923.2007.02914.x

Pacini, R., & Epstein, S. (1999). The relation of rational and experiential information processing styles to personality, basic beliefs, and the ratio-bias phenomenon. *Journal of Personality and Social Psychology*, *76*(6), 972–987. http://doi.org/10.1037//0022-3514.76.6.972

Patel, V. L., Arocha, J. F., & Zhang, J. (2005). Thinking and reasoning in Medicine. En K. J. Holyoak & R. G. Morrison (Eds.), *The Cambridge handbook of thinking and reasoning* (pp. 727–750). Cambridge University Press.

Patel, V. L., & Groen, G. J. (1991). The general and specific nature of medical expertise: A critical look. En K. A. Ericsson & J. Smith (Eds.), *Toward a general theory of expertise: Prospects and limits* (pp. 93–125). Cambridge University Press.

Pelaccia, T., Tardif, J., Triby, E., & Charlin, B. (2011). An analysis of clinical reasoning through a recent and comprehensive approach: The dual-process theory. *Medical Education Online*, *16*.Article 5890, https://doi.org/10.3402/meo.v16i0.5890

Schmidt, H. G., & Boshuizen, H. P. A. (1993). On acquiring expertise in medicine. *Educational Psychology Review*, *5*(3), 205–221. https://doi.org/10.1007/BF01323044

Schmidt, H. G., Norman, G. R., & Boshuizen, H. P. (1990). A cognitive perspective on medical expertise: Theory and implication. *Academic Medicine*, *65*(10), 611–621.

Stanovich, K. (2011). *Rationality and the reflective mind*. OUP USA.

Thirsk, L. M., Moore, S. G., & Keyko, K. (2014). Influences on clinical reasoning in family and psychosocial interventions in nursing practice with patients and their families living with chronic kidney disease. *Journal of Advanced Nursing*, *70*(9), 2117–2127. https://doi.org/10.1111/jan.12370

Wilcox, G., & Schroeder, M. (2015). What comes before report writing? Attending to clinical reasoning and thinking errors in school psychology. Journal of Psychoeducational Assessment, *33*(7), 652–661. https://doi.org/10.1177/0734282914562212

https://doi.org/10.1017/SJP.2020.18 Published online by Cambridge University Press