Psicología Educativa (2019) 25(1) 59-65

Psicología Educativa

http://journals.copmadrid.org/psed

# The Game and Creative Cognition. A Proposal of Intervention

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ARTICLE INFO

*Article history:*
Received 21 July 2018
Accepted 22 October 2018

*Keywords:*
Play
Creative cognition
Divergent thinking
Optimal experience
Childhood

A B S T R A C T

This paper is aimed at investigating the effects of the intervention through coupled variant games on the creative skills of a group of children. Coupled variant games refers to a group of games selected that meet the characteristic of being preferred by a group of children and, in addition, they were amended by the coupling of a variant designed for the purpose of promoting creative abilities. We worked with a group of children between the ages of 8 and 10 who were divided into two groups: experimental group and control group. Initially both groups participated in a pretest of creativity; then an intervention with coupled variant games was held for eight weeks with the experimental group. At the end of the process, both groups were evaluated with the same measures of creativity. The results show that children who participated in the intervention increased their performance in tasks that require the use of creative skills.

## El juego y la cognición creativa: una propuesta de intervención

*Palabras clave:*
Juego
Cognición creativa
Pensamiento divergente
Experiencia óptima
Infancia

R E S U M E N

El presente estudio tiene como propósito investigar los efectos de la intervención mediante juegos con variante acoplada en las habilidades creativas de un grupo de niños. Los juegos con variante acoplada se refieren a un grupo de juegos que se caracterizan por ser preferidos por los niños y que además han sido modificados para que desde sus demandas cognitivas promuevan las habilidades creativas. Se trabajó con un grupo de niños con edades entre 8 y 10 años, quienes fueron divididos en dos grupos: uno experimental y otro de control. Inicialmente, ambos grupos participaron en un pretest de creatividad para establecer una línea de base; posteriormente, se realizó una intervención con juegos con variante acoplada durante ocho semanas con el grupo experimental. Al finalizar el proceso, ambos grupos fueron evaluados con las mismas medidas de creatividad. Los resultados de esta investigación muestran que los niños que participaron del proceso de intervención con juegos con variante acoplada incrementaron significativamente su desempeño en tareas que requieren el uso de habilidades creativas.

Creativity refers to the ability of the human being to do the new and to redo the old, either by solving a problem or designing innovative products at any discipline, work, or situation level (Fuster, 2013). In addition, the creative skill requires that its alternative or divergent ways are considered to be innovative in one or more cultural contexts (Gardner, 2011). Likewise, some proposals have suggested that three subsystems are necessary for an idea, product, or creative discovery to take place. That way, creativity is the result of the dialogic interaction of themselves: 1) the cultural system that contains symbolic rules, 2) the system for the person who brings novelty to the symbolic field, and 3) the system made up of the field of experts who recognize, assess, and validate the relative innovation to the creative product (Csikszentmihalyi & Wolfe, 2014).

In this sense, neuroscientific studies have revealed important insights about the neural mechanisms underlying creativity, but the existing findings are highly varied and often inconsistent with each other. Despite the discrete progress aimed at neuroscience of creativity, it seems that there is strong evidence about the importance of the electrophysiological activity of the alpha rhythms in processes associated with various demands related to creative ideation (Arden, Chavez, Grazioplene, & Jung, 2010; Benedek, Bergner, Könen, Fink, & Neubauer, 2011; Benedek, et al., 2014; Dietrich & Kanso, 2010; Fink & Benedek, 2013; Jauk, Benedek, & Neubauer, 2012). Similarly, brain structures such as the prefrontal left cortex, the left inferior parietal region, and the right medial temporal lobe have been linked with the divergent thinking and with the generation of original ideas through

Cite this article as: Ocampo-González, A. A., Tovar-Cuevas, J. R., & Arteaga-Diaz, G. (2019). The game and creative cognition. A proposal of intervention. *Psicología Educativa, 25,* 59-65. https://doi.org/10.5093/psed2018a21

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imagination (Fink & Benedek, 2013; Fink et al., 2009; Jausovec & Jausovec, 2000; Martindale, 1999; Razumnikova, 2000). Particularly, the area 10 located in the prefrontal cortex (which includes sectors of the frontal pole and extensions of the medial cortex) from a functional point of view has been associated with mental wandering and the imaginative dimension (Green, Cohen, Raab, Yedibalian, & Gray, 2015; Howard-Jones, Blakemore, Samuel, Summers, & Claxton, 2005; Ramnani & Owen, 2004).

However, beyond the progress that the neuroscience of creativity has been advancing and the efforts of computer science to emulate creative behavior (Kahl & Hansen, 2015; Turner, 2014), it is essential to consider that the creative dimension plays a fundamental role to a sociocultural level, in terms of demand and challenge, but specifically regarding the essential mechanism for the construction of new knowledge. In the school setting, many of the current educational proposals are focused on the development of formal cognitive skills, oriented to prepare the student to respond to certain performance assessment tools. This process leads the institutions to build a student profile focused on disciplinary aspects, following instructions, memorization, and knowledge application. In these conditions, the non-formal cognitive skills often work only on an occasional basis in school, and often the institutions do not have structured proposals to address them carefully. As some authors have described, the construction process of rationality in which children enter the school environment sometimes does not consider the development of spaces to continue favoring the curiosity, a taste for novelty, and the development of creative skills (Csikszentmihalyi & Shernoff, 2008), a situation which is also evident in many of the social environments where adults perform (Amabile, 1998; Amabile & Pillemer, 2012). This possibly occurs because perhaps from the pedagogical knowledge the close relationship that is suggested between intelligence, executive functions, and creative skills is unknown. (Benedek, Jauk, Sommer, Arendasy, & Neubauer, 2014; Radel, Davranche, Fournier, & Dietrich, 2015).

Particularly linked to the idea of brain plasticity, there is the idea that creativity can be developed through the formation and the experiences that the individual lives. In this sense, several studies are found in the literature (from different approaches) that have evaluated the effects of the programs to stimulate creative skills in children, adolescents, and adults (Alfonso-Benlliure , Meléndez, & Garcia-Ballesteros, 2013; Antonietti, 2000; Baer, 2014; Cohen, 2006; Fleith, Renzulli, & Westberg 2002; Garaigordobil, 2006; Garaigordobil & Berrueco, 2011; Hosseinee, 2008; Hu et al. , 2013; Komarik & Brutenicova, 2003; Memmert, 2007; Memmert, Baker, & Bertsch, 2010; Saxon, Treffinger, Young, & Wittig, 2003; Torrance & Safter, 1990; Zachopoulou, Trevlas, & Konstadinidou, 2006), which suggests that creative abilities are being part of an initiative of studies increasingly refined and that outlines its possibilities towards the applicability of knowledge that is being built on creative cognition in such psychological process.

In this context, the present study aims to investigate the effects of an intervention with coupled variant games on the creative abilities of a group of children. In this way, the intention is to contribute to the growing body of knowledge to favor the advance capabilities in children aged 8 to 10; additionally, it is providing a possibility of work applied to addressing the tension between the position that the school assumes as a formalizing instrument of the child's cognition and the stance that perceives the school as a facilitator in the development of the creative potential of the subject.

Taking into account this intention and considering the "mediation" as an essential mechanism, this study adopted Vygotsky's cultural-historical perspective (1933/1967, 1930/1990) as a fundamental conceptual shaft for the orientation of the subject toward the growth and deployment of their creative potential, recognizing that this author takes imagination as a form of consciousness that is deeply linked with reality.

Moreover, it is considered the perspective of "flow" as a reference point for understanding the features of the game/task as a facilitator in the development of creative skills and as favoring the child's entry to the "state of optimal performance" (Csikszentmihalyi & Nakamura, 2010). In this sense, to configure the interventions through the game, initially the need to recognize the structure that should be in the process of intervention for the improvement of the creativity in children was identified, understanding the game as an activity that links the subject with "emotionally positive" situations and that, furthermore, constitutes an optimal scenario for cognitive deployment.

This intervention was planned considering situations of game from a position that contemplates the phenomenological aspects that affect access to "states of optimal performance" on the part of the subject, which favors the deployment of complex cognitive processes when approached from the perspective of the "mediation", eventually contributing to the improvement of creative skills in schoolchildren.

## Method

### Participants

From a group of 90 children between the ages of eight and ten and distributed in three classrooms in a school in the city, a random sample of 30 children of both sexes was selected. Among the selection criteria it was considered not to submit diagnosis of a psychological nor neuropsychological disorder and not to be involved in psychological therapy or intervention in cognitive processes of any kind. Before the intervention, a meeting was held with the parents of the children selected, in which they were informed of the objectives of the project and asked permission to work with their children through an informed consent form.

### Procedure and Instrument

Considering that for Spanish-speaking population there is no availability of the complete classical tests to evaluate creativity, such as the Creative Thinking Test of Torrance (TTCT) or the Uses of Objects Test (UOT), we only have adaptations that evaluate a single factor, like graphic creativity for example, we chose to use a validated test for Spanish-speaking population. In this way, selected children were randomly assigned to two groups of 15 subjects each. The *Prueba de Imaginación Creativa para Niños* (PIC-N; test of creative imagination for children) was applied to each of the children in both groups to assess the levels of narrative, graphic, and general creativity at a time prior to the intervention, and these same measures were taken four days more or less after applying the test.

The *Prueba de Imaginación Creativa para Niños* (PIC-N) was developed from the classic studies by Guilford (1980) and Torrance, Glover, Ronning, and Reynolds (1988) and is supported by research conducted with Spanish population. The PIC-N has been typified in school cohorts (using as sample 637 subjects between 8 and 11 years of age), so it appears as a useful measure for evaluating imagination and divergent thinking of children, both in clinical practices and in education. Considering that there are no normalized tests for the Spanish-speaking population to test the criterion validity of the PIC-N, it was contrasted with the *Test de Abreación para Evaluar la Creatividad* (TAEV), designed by De la Torre, which is a test that exclusively evaluates the component of graphic creativity. In addition, the results of the reference sample of the PIC-N were compared with the direct judgment of teachers about the creativity of evaluated subjects (it was acquired by applying the subscale of divergent thinking, which is part of the *Escala para la Detección de Alumnos con Altas Capacidades*-EDAC [Scale for Detection of Students with

High Capacities], the judgment of peers about the creativity of evaluated subjects (it was acquired by using a questionnaire of equal nomination, developed by the same team of researchers who developed the PIC-N), and the Piers-Harris Self-concept Test. The data relating to the statistical justification of the PIC-N, suggests that components constituting evidence and their properties are relevant. To account for the internal consistency of total creativity, test authors conducted a feasibility study using the different scores as elements of each of the games that make up the test. Cronbach's alpha for the reproducibility of the test was .83 (Artola, et al., 2012).

This tool makes a factorial approach possible to the measurement of creativity and allows the evaluation of a higher order factor corresponding to a *global score in creativity*, which in turn is composed of a measurement of graphic creativity and another of narrative creativity. In terms of narrative creativity, this measurement is obtained from a child's score in different variables at a linguistic level: fluency (the ability of the subject to produce a large number of ideas), flexibility (the ability of the subject to produce varied responses belonging to very different fields), and originality (the ability of the subject to produce ideas in a linguistic format away from what is obvious or established). On the other hand, the measure of graphic creativity is achieved as of the following figurative variables: originality (a subject's attitude to produce ideas in a graphical format far from what is obvious or established), development (refers to the level of detail, development or complexity of creative ideas), shadows and color (a peculiar variant of development, in which the aesthetic capacity of the subject is collected, its ability to increase its graphic creativity through the use of shading, color or faded), title (with the title other variables such as verbal fluency and originality are complementary). It is a bridge variable between narrative and figurative, as the stimulus that presents the PIC-N test is a visual command and a response is requested at a verbal level, and special details (in this variable, some details that reflect a capacity of insight or "perceptive restructuring": the ability to see the problem differently from other people).

After the evaluation by PIC-N, the experimental group (group 1) was exposed to an intervention with coupled variant games. For the design of the coupled variant games, a survey of 40 children was carried out with the purpose of selecting five games/and children's favorite activities. After the selection of the five games, an analysis of the cognitive demands that they require from the subject was performed. All games selected met the characteristic of being preferred by children and, in addition, were amended by the coupling of a variant designed for the purpose of promoting the deployment of creative processes.

The intervention procedure was performed with the completion of five games alternating weekly for eight weeks, in two 45-minute weekly sessions that took place at the same time and in the same physical space. In one of the weekly game sessions the Pictionary game was always performed with variant which served as a reference to assess a child's progress as a player in the process of intervention. The monitoring relating to the performances of each child at Pictionary with variant was recorded in a field diary. Following is a description of the coupled variant games used in the intervention process together with the respective coupled variant.

**Monopoly.** Description: game of real state (designed by Charles Darrow). The goal is to do a monopoly acquiring all real state property that appears in the game. Players move their tokens by taking turns around a board based on the score of the dice, and land in properties that they can buy from an imaginary bank or let the bank auction in case they are not bought. If the properties in which they land have owners, they may collect rent or who lands on it could buy them. Variant: after passing GO, the first three times, each player must perform: Go 1 – creative presentation, invent a greeting to introduce yourself in a creative way to others, for example: "Hello I am ... (while the greeting is accompanied with 'invented' body movements)"; Go2 – act as the puppet of the group (the group accommodates the participant in a curious position); Go3 – invent an innovative celebration and show it to the group.

**Jenga.** Description: Game of driving and mental skill (designed by Leslie Scott), in which participants must remove blocks from a tower taking turns and placing them on top, until it collapses. When playing, the wooden blocks are located in cross formation on levels of 3 blocks together (they must have the indicated proportion, so that they form a square when placed together) to form an 18-story tower. At each player's turn, each player must remove a block of wood from any of the lower stories of the tower preventing it from falling, place it on top of the tower to form new stories and make it grow in size. The player who did the play prior to the one that made the tower collapse is the winner. Variant: a previously word is written on each block that makes up Jenga. While each participant is playing, he or she must choose at least 3 words from the blocks that he or she removes (among the various blocks accumulated) to build a story around those three words.

**Uno.** Description: card game (designed by Merle Robbins) that has a deck containing two types of cards: normal and special or wild cards. You must have two or more participants. The goal is to get rid of all the cards that are "drawn" initially, saying the word one when the player has the last card in his or her hand. Variant: within the deck, there must be a card stating challenge, it goes on the stack of challenge cards. If the child overcomes the challenge he or she wins a turn and a wild card. If not he or she stays the same. The challenge cards imply various ways to solve a problem situation in a divergent way; for example, answer the following question (which is a searching task of remote associations): how are a padlock and a computer alike?

**Draw.** Description: although is not properly constituted as a game, it was selected within the favorite activities by children. Children are requested to make a group drawing on an eight pieces of cardstock of an ocean with "chimeric" animals (in this case, animals are composed of a mixture of various parts of other animals, including fantastic animals). Variant: while the kids work on the group drawing, every 7 minutes a story about the sea is read to them, in which they must determine the main idea and mention it, making use of their comprehensive capacity and skills of synthesis.

**Pictionary.** Description: it consists of guessing a word through a drawing made over paper (the game was designed by Rob Angel). The team that guesses the most words or phrases wins. The only communication allowed between the teams is drawing. Thus, the objective is to find a word by looking at the drawings that the partner is doing, in a race against time the winning team being the one who guesses the most words. Variant: whenever a member of one of the two groups wins, the winning child is given an envelope that contains cards that have a sequence in disarray and a blank card. Subsequently, the child takes out a card from a bag of "mysterious cards" having no connection with the cards that were in the envelope. From these cards (sequence in disarray + blank card + card with no apparent relation) the subject must create a story.

To track the changes at the level of creative skills during the intervention process, the performance of the subjects in the variant coupled to Pictionary (game remained constant during the 8-week intervention) was taken as a benchmark. For the analysis of the performance of children in the constant game (Pictionary with variant), we designed a system to assess the performance of children in each session from pilot testing. Particularly, we designed a grid which allows you to analyze the cognitive deployment that exposed children against the execution in the variant belonging to the Pictionary (related to the construction of stories from relating/sheets) and thereby locate their performance in one of 7 possible levels (see Table 1).

**Table 1.** Levels and Performance Scores of the Experimental Group in 8 Sessions

| Level | Criterion of Analysis of the Performance in the Development of Stories (PDS) | Score |
|---|---|---|
| L1 | No evidence of the ability to create narrative sequence (stories without a beginning, middle, and end), nor link with the elements given (cards). | (0-1) |
| L2 | No evidence of the ability to create narrative secuence, but manages to make a link with the elements given (cards). | (2-3) |
| L3 | Evidence of the ability to create narrative sequence (stories with a beginning, middle, and end), but without a stable link with the elements given (cards). | (4-5) |
| L4 | Evidence of the ability to create narrative sequence and performs a stable link with the elements given (cards). | (6-7) |
| L5 | Evidence of the ability to create narrative sequence, provides details that give further elaboration to the story, and performs a stable link with the elements given (cards). | (8-9) |
| L6 | Evidence of the ability to create narrative sequence, provides details that give further elaboration to the story and performs a stable link with the elements given (cards). The child introduces elements of fiction and fantasy in story. Or Evidence of the ability to create narrative sequence, provides details that give further elaboration to the story, and performs a stable link with the elements given (cards). The child introduce divergent elements in story, as original and unexpected situations. | (10-11) |
| L7 | Evidence of the ability to create narrative sequence, provides details that give further elaboration to the story, and performs a stable link with the elements given (cards). The child introduces elements of fiction and fantasy in story. In addition, the child introduces divergent elements in story, as original and unexpected situations. | (12-13) |

## Standardization of Scores

In accordance with the classification manual of the PIC-N, graphic creativity is scored in a range from zero to 40 points. The range of values that the score assigned can take to the narrative creativity can vary between two values that are established on the basis of the results observed in the sample of subjects exposed to the test so that we do not have a prior minimum and maximum value established. To obtain the score of the general creativity, the values obtained by the least component in the narrative creativity must be added to the values obtained in the graphic creativity, because the range of values for general creativity cannot be established theoretically either. Given that each of the groups was evaluated before and after, different value ranges were observed for each time, which did not allow making comparisons between moments for the groups. It was then decided to standardize the measurement of general and narrative creativity, in such a way that they would be all in the same scale from zero to 100 (it can be read from zero to 100%) using the following equation: where, $x_{ijk}$ is the score observed for the $ith$ individual $(i = 1, \ldots, 15)$ of $(jth$ the group $j = 1 = intervened, 2 = control)$ at the ( moment; $k = 1 = preintervention, 2 = postintervention) x^{*}$ and are, respectively, the minimum and maximum scores observed in the whole group of individuals without considering the moment and the group. The maximum and minimum values of the observed scores for general and narrative creativity and the values established for $x^{*}$ and $x^{'}$ appear in Table 2.

**Table 2.** Values Observed for the General and Narrative Creativity Scores and Minimum and Maximum Scores Used to Standardize the Scale of Creativity

| | Control group | | Intervention group | | Values set |
|---|---|---|---|---|---|
| | Pre | Post | Pre | Post | $x^{*}$, $x^{'}$ |
| Graphic creativity | 11<br>24 | 11<br>25 | 5<br>23 | 15<br>31 | 5<br>31 |
| Narrative creativity | 42<br>97 | 42<br>89 | 40<br>122 | 60<br>213 | 40<br>213 |
| General creativity | 59<br>112 | 58<br>113 | 47<br>141 | 58<br>232 | 47<br>232 |

## Data Analysis

To perform the comparison of the scores between the groups of individuals, first a graphical evaluation of the behavior of the distributions was performed and, given that the sample sizes can be considered small and the empirical distributional form of the observed data is not symmetrical, we decided to use non-parametric methods for data analysis. To respond to the hypothesis of effect of the intervention, we used the test of Mann-Whitney's *U*. To evaluate the change between moments of evaluation, we calculated a delta equivalent to the difference between the score observed in the post intervention with the pre-intervention score. It was assumed as maximum type I error led to a value of .05 and the results were obtained with the help of the program SPSS version 21 for Windows.

## Results

The total sample consisted of 16 girls, 7 of them assigned to the experimental group, and 9 to the control group, and 14 boys, 8 of them assigned to the experimental group and 6 to the control group.

The intra-group analysis allows us to observe an important increase in the value of the median score for narrative and general creativity in the group intervened during the second time of measurement. Graphic creativity showed an increase in its median value, though this increase was not enough to have the same magnitude observed in the other two variables. The results obtained for the control group show the inverse behavior, i.e., decreasing the average values of narrative and general creativity in the post-intervention and increasing the graphic creativity score in a minimum way (see Table 3).

When comparing the results obtained in both groups using as variable the difference between the scores (post-intervention score minus pre intervention score), it was noted that in the experimental group, 4 out of 15 children presented negative differences (post-intervention score lower than the pre intervention score) for the general creativity, 3 of the 15 presented negative differences for the narrative creativity and 2 of the 15 for the graphic creativity, while the 15 children assigned to the control group showed negative differences for both narrative and general creativity, 7 of the 15 presented negative differences in the scores of graphic creativity, 1 of the children showed no differences and 5 only increased their score by one percent within the standardized scale. According to the results observed in Table 2 within the intervention group there was a high variability in the differences for the scores of the narrative creativity which meant a behavior similar to the values of the general variability. The non-parametric test used to perform the comparison between the groups allows us to conclude that the behavior of the differences in scores is not the same between the groups and the *p*-values obtained made it possible to reject the hypothesis of equality for the three variables ($p$ = .000 for narrative creativity and general creativity and $p$ = .001 for graphic creativity).

**Table 3.** Average Levels (Medians) of Creativity before and after the Intervention in the Two Study Groups

| | | Pre-intervention | | Post-intervention | |
|---|---|---|---|---|---|
| Group | Type of creativity | Median | Range | Median | Range |
| Intervened | Narrative | 24.4 | 0.0 - 100 | 50.9 | 10.5 - 100 |
| | Graphical | 16.0 | 5.0 - 23 | 20.0 | 15.0 - 31.0 |
| | General | 28.7 | 0.0 - 100 | 52.3 | 15.5 - 100 |
| Control | Narrative | 42.7 | 2.4 - 69.5 | 19.9 | 0.0 - 32.8 |
| | Graphical | 16.0 | 11.0 - 24.0 | 15.0 | 11.0 - 25.0 |
| | General | 47.9 | 12.8 - 69.2 | 20.11 | 0.0 - 31.6 |

A more detailed intra-group analysis of the subcomponents of graphics and narrative creativity made it possible to observe a significant increase in the value of the median score for fluidity, flexibility, and originality at the level of narrative creativity during the second measuring moment, in the intervention group only. In terms of the components of graphical creativity, there was a slight increase in the median values of development, shadows and color, and title in the post-intervention assessment, as well as a slight decrease at the level of graphic originality. The results obtained for the control group showed a slight increase in fluidity and a decrease in flexibility at the level of narrative creativity. Similarly, there was a slight increase in development and a decrease in title at the level of graphic creativity (see Table 4). These results for the subcomponents of the graphic creativity did not present a significant change for both the intervention group and the group not intervened, which coincides with the maintenance of the values of graphic creativity for both groups at the level of the two moments measured.

With regard to the qualitative data in the process of intervention in the experimental group, positive changes were observed at the level of creative deployment of children. As mentioned above, the performance of the subjects in the Pictionary coupled variant was taken as reference for the observation of changes during the intervention process with games (constant game). As we evaluate the performance in the Pictionary game with variant, we observed that the 15 subjects, along the first 4 weeks of the intervention, had an average of 10 points in the performance in the development of stories (PDS). This performance alludes to the generation of stories (creative variant coupled to the Pictionary game) whose characteristics are defined by the developed construction, with story type structure, fantastic or divergent components, retaining the association between the elements provided as a reference (see Table 1). During the second half of the intervention (weeks 5, 6, 7, and 8), the average in the narrative production of the group of children was 12 points, performance that was characterized by the possibility of the child/protagonist to design stories involving the developed construction, with story type structure, composed of fantasy elements and divergent spins, retaining the association between the elements provided as a reference.

This indicates a trend in the group of children to locate gradually their performance in a more complex processing level (between 12 and 13 points) toward weeks 5, 6, 7, and 8. During the first session, 10 children were placed in level 6 of performance, while only 2 of the subjects were placed in the maximum level of performance (level 7). The rest of the children were placed between level 4 and level 5 of performance in the development of stories. Indeed, for week 8 data reveal that only 2 subjects were placed in level 6 of performance, while 12 children were positioned in the maximum level of performance (level 7). At the end of the session, only a subject was placed in the level 5 of performance in the constant game (Pictionary).

## Discussion and Conclusions

The results of this research support, in line with other studies, the possibility that creative skills can be modified through the design of specific interventions (Antonietti, 2000; Baer, 2014; Hu, et al., 2013; Fleith et al., 2002; Komarik & Brutenicova, 2003; Saxon et al. , 2003; Stevenson, Kleibeuker, de Dreu, & Crone, 2014). Particularly, the results confirm the hypothesis proposing that the intervention with games favors the increase of global creativity, confirming the results of studies that had shown positive effects of the game on creativity development (Baggerly, 1999; Garaigordobil, 2006; Howard, Taylor, & Sutton , 2002; Mellou, 1995; Memmert, 2007; Ott & Pozzi, 2010; Price-Coffee, 1995). This suggests that probably the game in its capacity as a cognitive tool contributes to the deployment of creative skills as higher mental functions.

**Table 4.** Medians and Ranges for the Scores Obtained in the Different Components of Creativity

| | | | Pre-intervención | | Post-intervention | |
|---|---|---|---|---|---|---|
| Group | Type of creativity | Component | Median | Range | Median | Range |
| Intervened | Narrative | Fluidity | 15.0 | 0.0 - 38.0 | 42.0 | 14.0 - 100.0 |
| | | Flexibility | 32.3 | 0.0 - 74.2 | 54.8 | 25.8 - 100.0 |
| | | Originality | 15.0 | 1.3 - 56.3 | 55.0 | 13.8 - 100.0 |
| | | Elaboration | 1.0 | 0.0 - 8.0 | 1.2 | 0.0 - 8.0 |
| | Graphical | Originality | 8.0 | 1.0 - 11.0 | 0.0 | 2.0 - 12.0 |
| | | Shadows and color | 5.0 | 0.0 - 8.0 | 6.0 | 4.0 - 8.0 |
| | | Special details | 0.0 | 0.0 - 0.0 | 0.0 | 0.0 - 4.0 |
| | | Title | 2.0 | 0.0 - 4.0 | 4.0 | 0.0 - 5.0 |
| Not intervened | Narrative | Fluidity | 22.0 | 11.0 - 59.0 | 24.0 | 13.0 - 60.0 |
| | | Flexibility | 38.7 | 6.5 - 48.4 | 35.5 | 3.2 - 54.8 |
| | | Originality | 15.0 | 0.0 - 40.0 | 15. 0 | 0.0 - 38.8 |
| | | Elaboration | 0.0 | 0.0 - 3.0 | 1.0 | 0.0 - 3.0 |
| | Graphical | Originality | 8.0 | 3.0 - 12.0 | 8.0 | 3.0 - 12.0 |
| | | Shadows and color | 4.0 | 3.0 - 7.0 | 4.0 | 3.0 - 7.0 |
| | | Special details | 0.0 | 0.0 - 1.0 | 0.0 | 0.0 - 1.0 |
| | | Title | 4.0 | 1.0 - 7.0 | 3.0 | 1.0 - 6.0 |

It can be concluded that the effect of the intervention with coupled variant games designed for this study contributes significantly to the increase in general creativity, particularly in the variables that make up the component of narrative creativity: fluency, flexibility, and originality. In regard to the graphic component, the elaboration and shadows and color variables rose slightly, but did not show a significant change. It is possible that there were no effects registered on aspects related to the thoroughness, the detail, and to the sense of the aesthetic at a graphical level, due to the fact that the cognitive emphasis of the coupled variant games that constituted the intervention allowed in greater proportion for the deployment of creative skills associated with production demands in semantic and linguistic aspects.

However, in a timely manner, this study suggests that the game from its status as preferred by the subject and in conditions of "mediation" ranks as a fundamental aspect for improving creativity. It is worth mentioning that the favorite game character accounts for the importance of the joint commitment level generated by the task mediated. In this sense, the level of attentional connection, which appeared in many of the sessions flowing in an effortless manner as suggested by the Flow theory (Csikszentmihalyi & Nakamura, 2010), can be mentioned as a qualitative aspect observed during the study.

In addition, the approach from the perspective of the creativity mediation in game situations distances this study in ways from intervention based on the concept of training, particularly the programs based on the training to make an impact on the deployment of cognitive processes, working from a paradigm in which the background suggests that subjects' exposure to work (which is said to put in operation certain cognitive components) generates improvements that would be expected to be transferred to more ecological situations. These training proposals, although they relate significant results for the study of cognitive processes and forms of intervention, favor only the line of bi-dimensional subject-object action, setting up dynamics whose conception of subject is reduced to "mechanical" relations established between the tasks and cognitive skills. Obviously, from these approximations there is tendency to accept that the subject is eventually positioned as a beneficiary from these relationships.

In this sense, to enrich this perspective, it is essential to place the look on postures that work from the importance of processes of "mediation" posed by Vygotsky (1933/1967; 1930/1990) and social processes, particularly those associated to cooperation (Runco, 2015). It is also essential to consider the perspectives that consider the relevance of the perceptions that subjects have of tasks, the intrinsic motivation, and wondering how the characteristics of the task affect the optimization skills of children to enter states of creativity (Csikszentmihalyi & Wolfe, 2014).

A possible limitation of this study refers to the fact that the findings uncovered by this research are part of an analysis that applies essentially to participating subjects, by which it is suggested to perform studies of this nature, involving samples of subjects of greater size and representativeness.

Finally, although the game itself is part of a child's daily life and of the interactions that he or she establishes with his/her environment, it is important to consider, as a possible limitation, the difficulty to carry out the evaluation of the level of change that subjects presented in everyday contexts, which can weaken aspects related to ecological validity. In this sense, it is also important to address approaches such as those proposed by Glăveanu (2014) and Botella and Lubart (2016), who claim that one cannot trust too much the psychometric paradigm, and this way decontextualize the creative process as if this really could reproduce in the demand raised from a "laboratory situation". This careful approach would imply that the value of the creative deployment circumstances should be recognized, without leaving aside the understanding of the essence of the process that is being studied at science, arts, design, school, or daily life levels.

## Conflict of Interest

The authors of this article declare no conflict of interest.

## Acknowledgments

We are grateful to the children, teachers and parents of the school where the research was carried out. We also thank Oscar Sierra Fitzgerald, Margarita Bedoya, and Elizabeth Calderon for collaborating with the structuring of aspects of the intervention component and the logistics of working with children.

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