

NEUROGAME

An Alternative and Complementary Method in the Teaching and Learning Process of Neuroanatomy

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ABSTRACT

The aim of this study was to manufacture board games, using materials of low cost, as a playful tool, alternative and complementary in the process of teaching and learning practical of Neuroanatomy. The study was a research-action, descriptive and exploratory, developed at the Human Anatomy Laboratory of the University of Pernambuco (UPE), Petrolina, from February to November 2016. The games were manufactured by three monitors of the Neuroanatomy discipline, with supervision of the responsible professor. To manufacturing of the games have utilized low-cost materials such as: Styrofoam sheet, A4 paper, paper scissors, glue, paintbrush, fabric inks and biscuit, Microsoft Office Word software 2010 version and printer. Seven board games were systematically manufactured, which deal the macroscopic and morphofunctional aspects of the spinal cord, brain stem, diencephalon, telencephalon, vascularization, peripheral nervous system and structures of difficult practical study, such as reticular formation and the afferent and efferent great ways. The production of board games with low cost materials has shown to be a simple, possible and inexpensive process, but it requires cautious execution during the stages. In this way, it was conceivable to develop a new playful, alternative and complementary tool for the practical teaching and learning of Neuroanatomy.

Keywords: learning, teaching materials, experimental games, neuroanatomy

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1. INTRODUCTION

Human Anatomy (HA) is an essential discipline for the formation of students in the health area (Kruse, 2004). The study of this discipline involves the understanding of the nomenclature and location of the specific structures of the human body, correlating them with their functions (Braz, 2009). Part of Human Anatomy, Neuroanatomy studies the morphofunctional aspect of the structures that make up the Human Nervous System and its relations with the environment (Machado and Haertel, 2014).

The study of Neuroanatomy usually involves the use of theoretical and practical classes, which in the last one, it is essential the use of cadaveric material, allowing the student to relate what is studied on the theory and the books, with the materials on the laboratories. In addition, its use is important to strengthen the ethical-humanistic aspects and contribute to the formation of future professionals in the area of health (Costa and Lins, 2012).

However, the conservation costs and the laws in Brazilian legislation make it difficult to obtain and maintain cadaveric material to be used in the human anatomy laboratories of higher education institutions, thereby compromising the teaching and learning process of the discipline (Melo and Pinheiro, 2010; Pontinha and Soeiro, 2014).

This process is difficult with regard to Neuroanatomy, since the programmatic content is extensive; The teaching material is, sometimes, insufficient for the number of students; The visual repulsion and the odor caused by the use of formaldehyde allied with the idea of death, in some cases, generates stress, anxiety and fear associated to the practical study; And, the memorization of complex structures and nomenclatures occasionally makes learning monotonous and discouraging (Fornaziero et al., 2003, Azambuja Montes and Souza, 2010, Silva Júnior et al., 2014, Anyanwu, 2014, Silva e Oliveira and Furtado, 2015).

Thus, it is necessary to elaborate and apply new methods and materials that summarize improvements in pedagogical practices for teaching and learning of Neuroanatomy (Fornaziero et al., 2003), like educational games. These can be defined as the use of playful principles to promote learning, the acquisition of knowledge and skills (Cain and Piascik, 2015). The use of board games, as a complementary tool, is an alternative that can facilitate the understanding of the theoretical class and promote a greater interest of the student by the practical class (Orlando et al., 2009), promoting a more attractive and dynamic learning (Arruda and Sousa, 2014).

Some alternatives, like the use of prosected pieces, anatomical models manufactures, didactic scripts, softwares and board games have been showing an effective in the active involvement of students during classes and, consequently, a more dynamic learning (Abdulmajed et al., 2015; Aburahma and Mohamed, 2015; Akl et al., 2007; Moraes et al., 2016).

In this sense, it is important to manufacture board games, since these can be used as a playful tool in the teaching and learning process to promote the critical and reflective performance of the students and facilitate the consolidation of knowledge, from the resolution of problems (Anyanwu, 2014). Thus, they allow to involve the morphofunctional neuroanatomics aspects, like a climbing in teaching and an emerging technology that possibly will have an impact on the formation of critical-reflexive professionals with a creative profile for the different situations (Anyanwu, 2014; Silva e Oliveira and Furtado, 2015, Silva et al., 2014).

Thus, the manufacture of these board games, which can be used during the practical classes of Neuroanatomy, is an alternative method that, used in consonance with the corpses (Calazans, 2013), to facilitate the teaching and learning process; Promote self-learning; Clarify difficulties in learning content; Encourage active participation; Acquire new information; As well as improving long-term retention and clinical application of knowledge; And finally be an important learning tool (Gibson and Douglas, 2013, Anyanwu, 2014, Abdulmajed et al., 2015, Aburahma and Mohamed, 2015).

Alternative methods that promote the teaching of Neuroanatomy in a playful way are an important aid in their learning, since it is a complex curricular component and with a vast nomenclature to be apprehended by future health professionals. In this way, the objective of this

study was to create board games, using materials of low cost, as a playful tool, alternative and complementary in the process of teaching and practical learning of Neuroanatomy.

2. DATA & METHODOLOGY

The study was action research, descriptive and exploratory, developed at the Human Anatomy Laboratory of the University of Pernambuco (UPE), Petrolina, in the period from February to November 2016. The production was carried out by three selected students-monitors of the Program of Academic Strengthening of the UPE (PFAUPE) for the disciplines of Locomotor Apparatus Anatomy, Systemic Anatomy and Neuroanatomy of the Physiotherapy course.

2.1. Board game manufacture

For the preparation of the board games were used low-cost materials like Styrofoam sheet, A4 paper, paper scissors, glue, paintbrush, fabric paints, biscuit (figure 1), Microsoft software Office Word 2010 version and printer. In addition, the elaboration of the questions for the games was based on consultations carried out in Neuroanatomy books indicated in the discipline schedule.

Three pins of different colors were manufactured with biscuit to represent the participants; a Styrofoam was coated with A4 paper; the manufacturing of the board was used Styrofoam as base, colored with the use of brushes and fabric inks; the question cards, board boxes, and pictures were formatted in Microsoft Office Word 2010 software and printed on A4 paper.

The board houses were glued in the board in a sequential way, the images used for questions, while the question cards were glued on card stock and coated with plastic tape on the edges to make them more rigid and preserved. The board houses are related to the four types different questions developed for the game: "Who am I?"; "Direct question"; "True or false?", "Image", "Pass" and "Advance two houses".

The games approach the morphology and function of the structures that compose the Human Nervous System. The playful material was used during practical classes and shifts of the discipline of Neuroanatomy for students of the first semester of the Physical Therapy course, presenting a good acceptance, but the impact of this material on their performance was not evaluated in this study.

3. FINDINGS & DISCUSSION

3.1. Findings

The manufacturing of board games was a process with simple steps, but requiring prudent execution. The process began with the consultation in books, text and atlas of Neuroanatomy, in order to strengthen the theoretical reference utilized to formulate the questions. In this stage, for each board, questions were developed at different levels, low, medium and high difficulty. Thus, the playful and challenging character of the games were consolidated.

These questions were formatted on standard-size cards (4.21inx2.91in) using the Microsoft Office Version 2010 software. With the same dimensions were formatted the figures that made up the back of the question cards, that identified them as to the type of question, among the four types developed for these games.

The houses of the trail of the boards were formatted with the same software, with standard dimensions of 2.36in x 2.16in and the images selected from the internet or books. In this stage full attention was necessary, because the size patterns must be respected for the playing cards, game houses, and the images present dimensions that allow their visualization and, due to the large number of these models per board, the errors and disproportionate measures may occur. After, the formatting material was printed on A4 paper.

Styrofoam sheets were painted with brushes and fabric paints on the upper and lateral sides (Figure 2). The cutouts of the board houses and the selected images were glued onto the board, completing their preparation. For questions cards, more extensive part of the process because they needed to be glued one at a time, used cardboard, the same size, to provide them with greater

rigidity. In addition, after the elaboration of these cards adhesive tape was used to cover their edges, aiming to increase the material durability.

In this way, it was possible to construct seven board games (figure 3), which approach the macroscopic and morphofunctional aspects of the spinal cord, brainstem, diencephalon, telencephalon, central nervous system vascularization and structures of difficult practical study, such as reticular formation and the great afferent and efferent ways, as shown in figure 4.

The manufacturing of the games was made in a systematic way, starting from the elaboration of the questions to the preparation of the board (figure 5). It has shown to be simple and fast, whereas the construction of the questions cards, board houses and pictures consisted of the longer and meticulous steps.

3.2. Discussion

The development of educational games is essential for innovation and diversification of the teaching and learning process. The constant use of traditional teaching methods become the study discouraging to the student, since they sometimes consider the study of Human Anatomy and Neuroanatomy as decorative.

Thus, board game is a playful and complementary method that can be integrated with the traditional teaching methods of these disciplines (Anyanwu, 2014), aiming to potentiate attractive and dynamic learning (McCarroll et al., 2009).

For Fornaziero, Regina and Gil (2003) the use of these games generate enthusiasm and motivation throughout the learning, becoming attractive educational process for the students. This method involves active participation and the development of skills like interaction between participants, encouraging the exchange of knowledge. Thus, it presents a great importance in the development of critical thinking and in the collective resolution of problems, essential skills for the practice of health professionals, as stated by Gibson and Douglas (2013).

From this perspective, the use of games in the teaching and learning process has impacts on the training of students in several aspects. The inclusion of these games in the curriculum of the disciplines presents positive results, not only in the cognitive aspect, but also in the interactional behavior and the development of abilities. As Alk et al. (2007) shown that this tool has great potential to promote learning in the various domains: cognitive, affective and psychomotor.

In addition, other studies have evaluated the impacts and effectiveness of the use of games in the training of students, and have presented results that corroborate positive impact of the use of games as a teaching tool (Gibson and Douglas, 2013, Anyanwu, 2014, Abdulmajed et al., 2015, Aburahma and Mohamed, 2015). According to these studies, students have developed skills such as creativity, feeling more motivated in the competitions and challenges posed by the game, gaining greater understanding and retention of the contents for long time, as well as allowing easy identification of key ideas and content with smaller and larger domain.

In this way, the student ceases to be passive in the teaching and learning process and it becomes the protagonist, while the professor ceases to play the main role and becomes the mediator of this process.

Generozo, Escolano, and Dornfeld (2007) proposed a board game about the Human Anatomy and Physiology of the systems, for students of the 2nd year of High School and verified greater acquisition and fixation of the contents, highlighting the use of this tool in a complementary way to the other methods of teaching. These studies corroborate the benefits and positive impact that the games promote in student learning, according to the literature analyzed, corroborating with Anyanwu's (2014) study.

The manufacture of board games for teaching and learning in higher education is still an underdeveloped practice. Thus, there is scarceness of studies in the literature that deal about production process them. The Anyanwu's study (2014) is the only one, until then in the literature that presents the development and application of a board game on Human Anatomy as a complementary tool in Higher Education. In his study, the author manufactured a zoned board:

“General Road”, “The Vascular Street”, “The Osteology and Muscular Avenue” and “Nerve Lane”, according to the content approached.

On this there were question-cards with specific problems according to the zone of the board. In addition, the game had a bank with a fictitious coin drawn up for its applicability, distributed at the beginning of the game to the players, in identical amounts. However, this study focuses on the constituents of the game, the rules and the evaluation of the perception of the students regarding the use of this tool in pedagogical practice, but does not refer to the materials used to make it, as well as its accessories.

The present study produced 7 board games describing the whole procedure adopted, which was also possible to manufacture 600 question-cards, according to the topics covered in Neuroanatomy discipline. In addition, the detailing of the steps, and to know the low costs materials used to manufacture them, is essential, allowing researchers, teachers and students to produce, develop and use their own materials as a way to retain and complement the contents worked in the classroom.

On the other hand, board games are commonly used as a learning tool in elementary school. In their study, Silva et al. (2014) developed a board game on the theme "Fundamentals of Ecology" for students in the 3rd year of High School, and showed the importance of its use for learning, as well as the relevance of implementing this method of teaching to traditional and expository methods on the pedagogical practice of others disciplines.

The elaboration of board games, from the use of materials of low cost becomes the educational tool cheaper. In this sense, it is worth emphasizing the importance of developing these games with this type of material, making them accessible for both professors and students.

For the Neuroanatomy discipline, the literature presents a scarceness studies on the board games manufacture used as a complementary tool in the its teaching and learning practical process. In this perspective, it is necessary to develop more studies on the preparation of board games for Human Anatomy and Neuroanatomy, as well as the evaluation of students' efficacy and perception regarding their application.

4. CONCLUSION

The manufacture of board games, using low-cost materials, proved to be a simple, possible and accessible process, but it requires prudent execution during the stages. It presents great relevance by showing other pedagogical material to be used in the teaching-learning process of the Neuroanatomy discipline, since they are easy to handle and make it suitable for students and professors.

Thus, it was conceivable to develop an alternative and complementary tool to the traditional method of practical teaching of Neuroanatomy. However, the literature presents a scarceness studies related to the manufacture of this type of pedagogical material. Therefore, it is necessary to develop new studies that explore the stages and materials used to make board games, in order to contribute to the process of retention of learning. In this sense, new games can be developed, customized, for different disciplines. Despite being one more tool in the process of teaching and learning in the human morphology area, the use of the corpse is essential in this process, and the tool produced is complementary on the process.

Based on the analyzed literature it was perceived that this type of tool is widely used in basic education, leading us to believe that its use in higher education will obtain similar results, given the presence of the playful enabling the teaching and learning process, and encouraging the instinct of competition. With this, students cease to be passive agents in process one, and become the builders of themselves knowledge.

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APPENDIX 1

Schemes and Figures

Figure 1.Low cost materials used for the manufacture of board games



Figure 2.Low cost materials used for manufacturing the game.

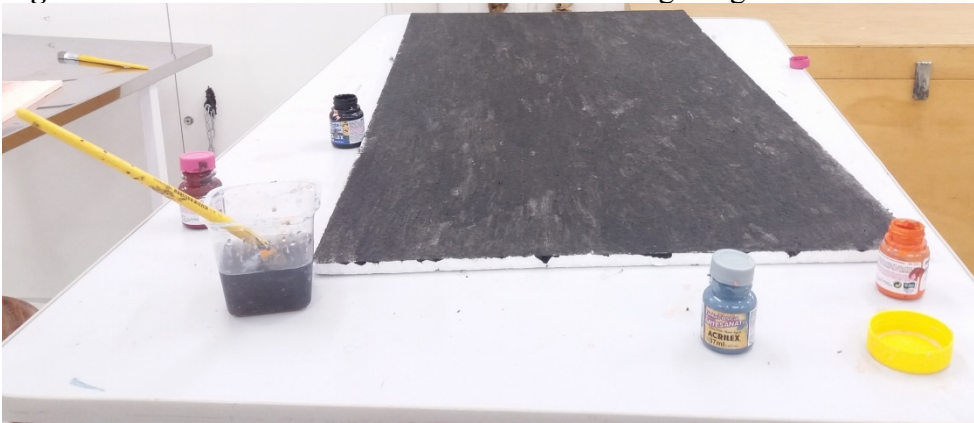


Figure 3.Manufactured neurogame exemplary.

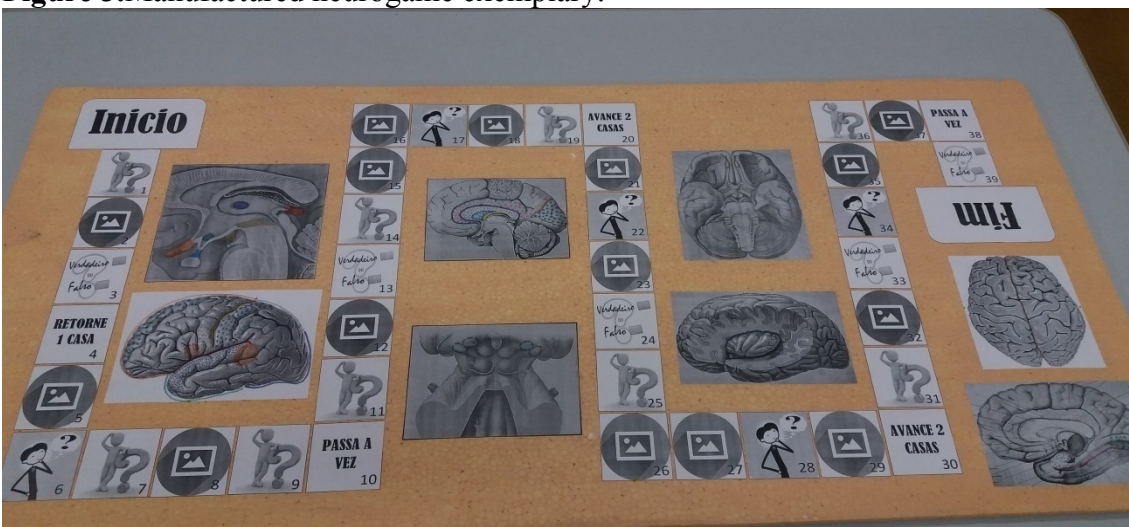


Figure 4. The diagram shows the contents approached in each seven board games.

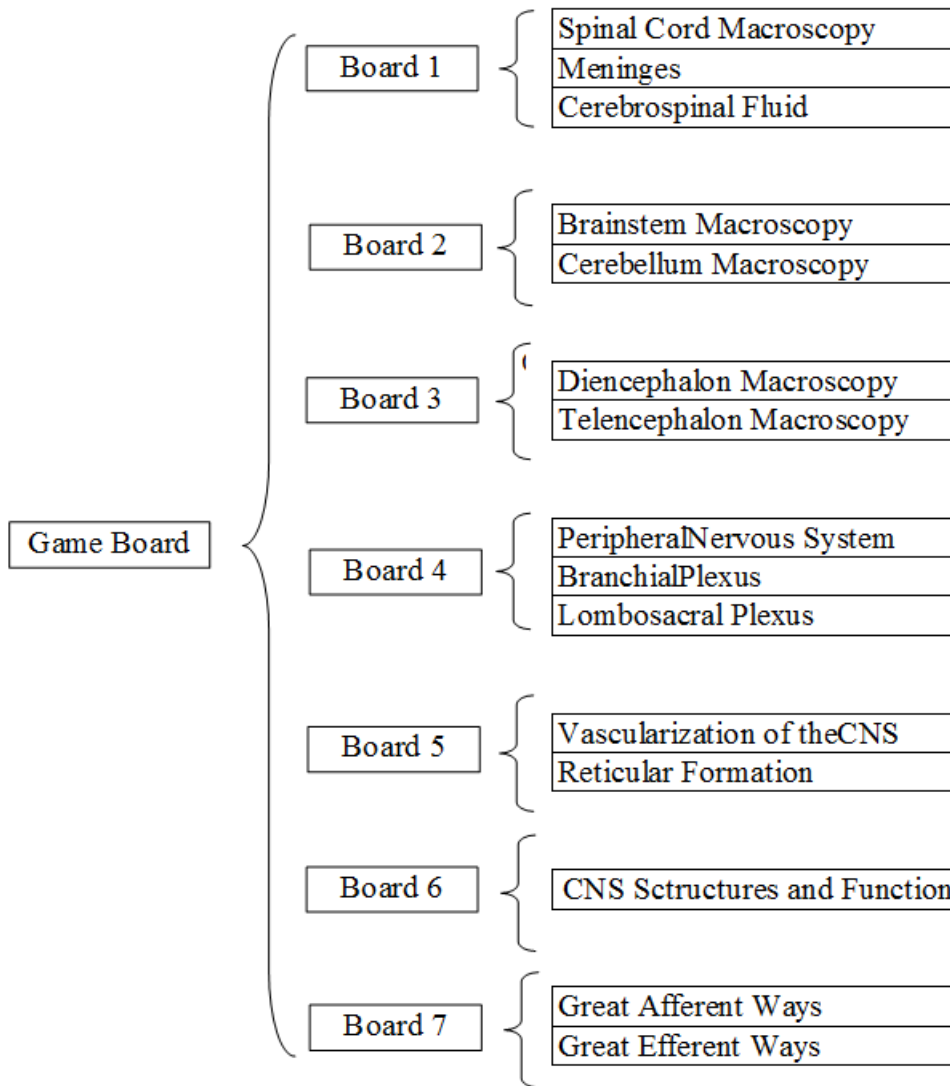


Figure 4. Steps for manufacturing the seven board games.

