

***Using a Collaborative Modern Board Game to Characterise Problem-solving Experiences  
in Physiotherapy Students***

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**Abstract**

New paradigms for curriculums designing in health professions defend the inclusion of structured methodologies to train comprehensive skills for problem-solving. This paper aimed to characterize the physiotherapy students' problem-solving experiences using a collaborative modern board game (MBG). An exploratory study was performed with a purposive sample of 17 physiotherapy students recruited from the School of Health Sciences of Polytechnic Institute of Leiria. Participants were included if they were: ≥18 yrs.; physiotherapy students and agreed to voluntarily participate. They participated in a 2-hours learning experience using the MBG TEAM 3, that is played in teams of three players, with each player taking different roles: the monkey who cannot speak, the monkey who cannot see, the monkey in the middle. At the end, each participant fulfills a questionnaire about the personal experience in the following domains, using a Likert scale of 1- 7 (I total agree): Team working (TW) (personal feeling of competence to play -TW1; empathy to other players - TW2); innovative and creative thinking (ICT) (creative expression of opportunities - ICT1; freedom to experiment new things - ICT2). Descriptive statistics and the Spearman rank were calculated to characterize students' perspectives and to describe relationships between TW abilities and ICT. Participants (4 males; 20.14±4.34 yrs.) presented the following mean values ICT1(5.05±1.24); TW2(6.05±0.97); ICT1(4.95±1.40); ICT2(5.85±0.96). The TW1 was significantly correlated with ICT1 ( $r=0.44$ ;  $p=0.048^*$ ); ICT2 ( $r=0.45$ ;  $p=0.041^*$ ). This study demonstrated the potential of MBG to characterise and monitor personal learning experiences in problem-solving scenarios for physiotherapy students.

Keywords: Problem-solving, Health Students, Games

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## **Introduction**

Student learning in higher education has been extensively investigated, including areas such as student engagement, critical thinking, skills development for team working and problem-solving skills training (Klegeris and Hurren 2011). Problem-solving approaches stimulating the learning experience in postgraduate students, promoting motivation, leadership development and teamworking. Additionally, training problem-solving skills is an innovative and crucial response to the challenges of training undergraduate students in health courses. Its potential is recognized, however further research need to be conducted to demonstrate how these methods should be implemented and consolidated in higher education institutions (Batista et al. 2005).

There is a consensus in the literature about the importance of training different decision styles for the efficient problem-solving process in health care. In fact, understanding this process might be crucial in very complex clinical settings, such as in palliative care or in chronic disease long-term care (Kryworuchko et al. 2016) (Bloomer et al. 2018). These are very specific challenges and should be preferably trained since earlier, in undergraduate health courses (Noohi, Karimi-Noghondar, and Haghdoost 2012).

Different methods have been used for training comprehensive skills for problem-solving in health students, including creative and critical thinking within a team work format (Gould, J. Christine; Schoonover 2009). Explained by their nature, games have been highlighted as a powerful way of developing social and emotional complex skills, that are crucial for feeling competence during problem-solving training (Hromek and Roffey 2009). Specifically, board games experiences create high levels of engagement and nonthreatening yet competitive or collaborative class atmosphere (Boghian, Ioana; Venera-Mihaela Cojocariu; Popescu, Carmen Violeta; Mățã 2019).

Despite the potential of board games for training essential problem-solving skills (communication skills in a team work atmosphere), there are not sufficient related-research in undergraduate health students (Boghian, Ioana; Venera-Mihaela Cojocariu; Popescu, Carmen Violeta; Mățã 2019). For example, it would be important to understand how the physiotherapy students consider the experience with games to train problem solving abilities, mainly because of its importance for long term management of chronic disability, which is very common and truly challenged for these students (Parry and Brown 2009). Therefore, this paper aimed to characterize problem-solving experiences using a collaborative modern board game (MBG) in physiotherapy students.

## **Materials and Methods**

An exploratory study was performed using a collaborative MBG for a 2-hours experience, while we collect students' self-experience during problem-solving scenarios.

## **Participants and Setting**

Recruitment and data collection were performed during December 2020-January 2021. Physiotherapy students from the School of Health Sciences of Polytechnic Institute of Leiria that were interested in participating were invited to provide informed consent through an electronic form. Participants were included if they had more than 18 years old, if they were physiotherapy students and agreed to voluntarily participate. A purposive sample of 17

physiotherapy students accepted to participate. All procedures performed in this study complied with the ethical standards of the Institution Ethical Committee and with the Helsinki Declaration (1964) and its later amendments or comparable ethical standards.

### **Data Collection Instrument**

The participants fulfilled a pre-experience survey that consisted of demographics information, including sex and age.

At the end of students were invited to fulfill a gaming experience survey. This instrument was created based on Bandura's instructions on how to build instruments to assess game-based experiences, since no prior survey existed, in this specific field (18). The players' experience survey was previously created by the research team, and it was divided into two different constructs: (i) Team Working (TW) and (ii) Innovative and Creative Thinking (ICT). The TW was assessed by 2 different sentences: "personal feeling of competence to play" (TW1) and "empathy to other players" (TW2). The ICT was also assessed by 2 different sentences: "I had opportunities of creative expression" (ICT1) and "I had freedom to experiment new things" (ICT2). Each of these sentences received a quotation of 1-2 (slight); 3-4 (moderate) and 5-7 points (strong).

### **Game-based Protocol**

The research team adapted Team 3 board game to deliver a serious game approach to physiotherapy students. We followed the Design, Play, Experiences (DPE) framework (Winn 2009) with the required adaptation to include the facilitator and the analogue nature of the game. The facilitator's role was essential to explain the rules of play and the game objective. The facilitator conducted a final debriefing (Crookall 2010). This reflexive exercise helps students to fully understand the game goal and evaluate their behavior during gameplay. Only after the debriefing, the students proceed to their own evaluation of the experience, using the respective survey. Team 3 was play in teams of 3 players, each player taking different roles in terms of communication. One of the students simulated a monkey who cannot speak (A), the other simulated a monkey who cannot see (B) and finally, the middle one needs to transmit the information between both A and B (Figure 1). Obviously, during this experience the players need to solve a huge amount of communication problems to reach the final objective of Team 3. Each group has 90 minutes of the experience with Team 3, changing the role of the players, to provide the 3 different experiences to each player. The last 30 minutes were expended in performing the debriefing and the final evaluation.



Figure 1. Two Players Using Team 3 While They Are Experimenting Different Communication Restrictions (Use of Photo with Students' Permission).

## Data Analysis

The players experience survey was analyzed considering a descriptive analysis of the score in TW (mean  $\pm$ standard deviation of TW1 and TW2) and in ICT (mean  $\pm$ standard deviation of ICT1 and ICT2). Correlations between these two dimensions were calculated using the spearman rank test ( $p < 0.05$ ). A correlation coefficient lower than 0.10 represent a weak correlation; of 0.30 were considered moderate and larger than 0.50 were considered strong.

## Results

Seventeen physiotherapy students (4 males; 20.14 $\pm$ 4.34 yrs.) participated in this study.

### Self-rated Students' Score about Team Working and Innovative and Creative Thinking During Team 3 Session

Self-reported results about students' experience with Team 3 indicate greater dispersion in the answers about TW1 (sd=1.24; min.2-max.7) and about ICT1 (sd=1.39; min. 1- max- 7). The higher mean values were presented in TW2 ( $x=6.05$ ) and in ICT2 ( $x=5.86$ ). Table 1 presents mean values of students' self-rated about TW constructs and table 2 presents mean values of students' self-rated about ICT constructs. The percentile distribution of these values can be found in graphic 1.

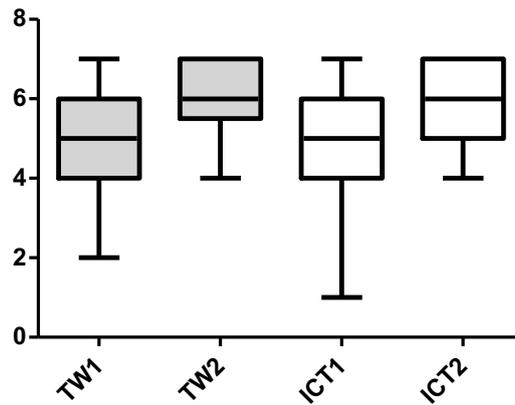
Table 1. Mean Values of Students' Self-rated about Team Working Constructs

Team working (TW)	x $\pm$ sd	min-max
Personal feeling of competence to play (TW1)	5.05 $\pm$ 1.24	2-7
Empathy to other players (TW2)	6.05 $\pm$ 0.97	4-7

Table 2. Mean Values of Students' Self-rated Innovative and Creative Thinking. Constructs.

Innovative and creative thinking (ICT)	x $\pm$ sd	min-max
I had opportunities of creative expression (ICT1)	4.95 $\pm$ 1.39	1-7
I had freedom to experiment new things (ICT2)	5.86 $\pm$ 0.96	4-7

Graph 1. Percentile Distribution of Students' Self-rated Score about Team Working and about Innovative and Creative Thinking Constructs During the Game-based Experience.



TW1, personal feeling of competence to play; TW2, empathy to other players; ICT1, I had opportunities of creative expression; ICT2, I had freedom to experiment new things.

### Correlations Between Team Working and Innovative and Creative Thinking Constructs

There are moderate and positive correlations between the students' self-rated score in TW1 and ICT1 ( $r= 0.44$ ;  $p= 0.048$ ); and between TW1 and ICT2 ( $r= 0.45$ ;  $p= 0.041$ ). Correlations coefficients between TW and ICT constructs are presented in table 3.

Table 3. Coefficient Correlations Between Team Working and Innovative and Thinking Constructs During Gamed-based Experience.

	Personal feeling of competence to play (TW1)	Empathy to other players (TW2)
I had opportunities of creative expression" (ICT1)	$r=0.44$ $p=0.048^*$	$r=0.00$ $p=0.99$
I had freedom to experiment new things" (ICT2)	$r=0.45$ $p=0.045^*$	$r=0.06$ $p=0.79$

### Discussion

A 2-hours gamed-based experience demonstrated that MBG are useful instruments to characterise and monitor personal learning experiences in problem-solving scenarios for physiotherapy students.

Greater dispersion in the students' scores about Personal feeling of competence to play Team3. This result might be explained by the natural challenge of being playing Team 3 for the first time, which naturally generate positive stress and, therefore, different sensations of competence. It is interesting to understand that despite of being a stressing experience, Team 3 does not provide a sensation of threat, contrarily to other games (Porter and Goolkasian 2019). The feeling of competence depends on the different copying strategies developed by students while they are trying to find solutions in a team format (Eizirik 2015). The

qualitative analysis of the copying strategies used by students might be an important improvement in future studies in this field.

Greater dispersion in recognizing opportunities of creative expression while students are playing Team 3. The role of modern board games on creative potential is not fully explored in research. However, there are creative and non-creative board games and Team 3 is a collaborative game and a non-specific strategy for developing creativity (Mercier and Lubart 2021). So, possibly some students interpret Team 3 as a collaborative experience that promotes creativity, but some students do not. In future experiences with Team 3 it would be important to interview students about restrictions or opportunities of this game feel creative.

In this exploratory study, students demonstrated they feel they feel more creative when they feel more self-competent during Team3 experience. In fact, previous authors have been concluded that self-competence is an important aspect of students' metacognition, and it is crucial for a positive academic experience. Metacognition plays an important role in oral and reading communication and comprehension and in problem solving performance. Furthermore, being creative is particularly important to combine elements in order to create new solutions to a problem (Tallman 2019). Curriculums designing in health courses will benefit of the inclusion of training strategies able to combine both creative and self-competence dimensions. In fact, this exploratory study creates an opportunity to design a new curriculum paradigm for health students training. New curriculums for these students may include the experimentation of adapted modern board games to train socio-emotional dimensions for ensuring quality in taking care provision. The application of modern board games for training socio-emotional training skills in health students is a new topic, however digital and analog technical games have been used for medical staff training in different scenarios, such as "learning of elementary clinical pharmacology" or "handling problems about disable people" or even "trying to make patients' diagnosis registration in online platforms"(Bochennek et al. 2007).

## **Conclusion**

This study demonstrated the potential of MBG to characterise and monitor personal learning experiences in problem-solving scenarios for physiotherapy students. Based in these promising results we are creating an opportunity to design a new game-based curriculum paradigm for health students training. The brief experience reported in this study demonstrated the potential of a collaborative board game (Team 3) to combine creativity and personal competence feelings, both important constructs for positive academic learning and for high-quality in care provision.

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