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The influence of task demand and social categorization diversity on performance and enjoyment in a language learning game

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ABSTRACT

Task demand type (e.g., competitive, cooperative, conjunctive) is an important factor influencing learning motivation and performance in a group. Limited research is available regarding conjunctive task demand for learning tasks, especially for the lower performing individuals. Additionally, group composition or social categorization diversity in a group is another important yet relatively understudied factor. To fill the research gap, this study attempted to examine the effects of task demand and social categorization diversity in a group on motivation and performance in a computer-based foreign language learning game. Seven conditions were included: 2 (social categorization diversity: in-group or out-group) *x* 3 (group task demand: competitive, conjunctive, or cooperative) plus an individual task demand control condition. A total of 102 undergraduates without prior Italian language background were randomly assigned to one of the seven conditions to play an Italian learning game on the computer in the laboratory for about 15 min. We found that for inferior group members, a conjunctive task was the most effective for the performance of learning Italian vocabulary. Significant interaction effects between social categorization diversity and task demand were found for both task performance and enjoyment. Implications for serious games and mediated educational tool design are discussed.

1. Introduction

The effects of the competition and cooperation aspects of group task demand on motivation, engagement, and task performance have been researched in a wide range of domains, including physical persistence, motor performance, learning, and group decision making (Deutsch, 1949; Johnson, Johnson, & Stanne, 1986; Lungu & Debas, 2013; Tauer & Harackiewicz, 2004). As competition and cooperation are the basic mechanics present in most computer and video games, particularly multiplayer gaming, scholars are beginning to examine the effects of competition and cooperation in digital games on

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enjoyment (Schmierbach, Xu, Oeldorf-Hirsch, & Dardis, 2012), motor performance (Peng & Crouse, 2013; Peng & Hsieh, 2012; Staiano, Abraham, & Calvert, 2012), and aggression (Eastin, 2007; Ewoldsen et al., 2012; Schmierbach, 2010; Velez, Mahood, Ewoldsen, & Moyer-Guse, 2012).

The effects of group task demand on lower performing (inferior) individuals is relatively understudied. Understanding how lower performing individuals are impacted by task demand and identifying ways to promote performance and motivation are critical for serious games (Ritterfeld, Cody, & Vorderer, 2009) and mediated educational tools because it is crucial to benefit all users when leveraging serious games and other technology-based tools for motivation and performance enhancement. Otherwise, this might result in "the poor get poorer". To the best of our knowledge, the current research in serious games and computer-based education lacks evidence regarding lower performing individuals. Therefore, the first goal of the present study is to add research evidence regarding the effects of task demand type on lower performing individuals.

One type of group task demand that has received considerable attention in the group process and motivation literature are conjunctive tasks, in which the group's overall performance depends on the results of the inferior group member(s). Studies have consistently found that conjunctive tasks are effective in promoting inferior members' motivation, particularly in physical and motor performance tasks (see Weber & Hertel, 2007, for a meta-analytic review). However, conjunctive tasks have not been fully explored as a game mechanic or in cognitive performance tasks. Given its motivational potential in the physical and motor performance domain, research is needed to examine whether conjunctive tasks would result in similar motivational gains for the low-performing partner in game contexts or cognitive performance contexts. If similar results are found, conjunctive task demand can be applied for motivational gain and may have significant impact for educational games or academic learning. Further, there is very limited research evidence on the effects of conjunctive task demand on cognitive tasks, especially learning outcomes. Thus, it is almost unknown if a less capable individual would also benefit from conjunctive tasks when it comes to the educational context. Therefore, the second goal of the present study is to fill the gap in the current body of research regarding the effects of conjunctive task demand on motivation and performance in the domain of learning and cognitive tasks (i.e., a foreign language learning computer game).

Additionally, motivation gain related studies targeting inferior group members predominantly center on extrinsic motivation, while overlooking intrinsic motivation. Intrinsic motivation, which is mostly operationalized as enjoyment of task, is an important component for both explaining and predicting human activities (Deci & Ryan, 1985). The assumption of gaming is based on the premise of engaging players via a fun experience. Understanding how task demand type influences enjoyment is critical for the development of games to increase motivation. Therefore, the third goal of the present research is to examine the effects of competitive, cooperative, and conjunctive task demands on intrinsic motivation as well as performance for lower performing individuals in a cognitive task using a digital game.

Competitive, cooperative, and conjunctive task demands all operate in the group setting. As such, social categorization diversity of the group is an important factor to consider. However, only limited evidence is available regarding the potential moderating effects of social categorization diversity in multiplayer gaming and these studies mostly focus on physical exertion games or violent video games (Peng & Hsieh, 2012; Velez et al., 2012). Therefore, the fourth goal of the present research is to expand empirical evidence regarding the potential interaction effects of social categorization diversity and group task demand on motivation and performance to the serious games for learning domain.

2. Literature review

2.1. Task demand type, motivation, and performance

Working in a group elicits an increase in effort of individuals when compared to working alone (Allen & Hecht, 2004; Hüffmeier & Hertel, 2011). The most frequently studied task demands in group settings include competitive, cooperative, and conjunctive tasks. Competitive tasks involve at least two individuals attempting to outperform the others in a zero-sum manner. Cooperative tasks involve at least two individuals working together to attain a common goal (Johnson & Johnson, 1989). It needs to be noted that cooperation can exist in forms of outcome-interdependence and means-interdependence (Johnson & Johnson, 1989). Outcome-interdependent cooperation exists when "each group member receives the same reward for successfully completing a joint task" (Johnson & Johnson, 1989, p. 24). Means-interdependent cooperation exists "when individuals perceive that a task is structured so that two or more individuals are required to coordinate their efforts to complete it" (Johnson & Johnson, 1989, p. 25). In the current study, cooperative tasks are conceptualized in the form of outcome-interdependent cooperation, which are similar to additive tasks. In the conjunctive task setting, the overall performance of the individuals involved in the group task is determined by the results of the lower performing individual. An increasing body of research has found group task demand to be superior relative to working alone in triggering motivation for motor performance (e.g., weighted exercise bracelets) and cognitive maximizing tasks (e.g., simple math calculation) (Kerr & Tindale, 2004; Lount & Phillips, 2007; Pettit & Lount, 2010).

Recently, the task demands of competition and cooperation have been examined in video game play settings. A majority of the research focuses on the direct comparison between competition and cooperation and their combined effects on enjoyment and aggression. Very few studies compared group-based task demands (e.g., competition, cooperation) with individual/single player conditions. Among the existing studies that compared multiplayer conditions with individual conditions, it was found that multiplayer conditions provided players with more enjoyment (Peng & Crouse, 2013) and produced higher motivation and performance (Peng & Hsieh, 2012) than the individual/single player condition in the physical persistence