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Girls' video gaming behaviour and undergraduate degree selection: A secondary data analysis approach

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ABSTRACT

Girls' uptake of physical science, technology, engineering and mathematics (PSTEM) degrees continues to be poor. Identifying and targeting interventions for girl groups that are likely to go into STEM degrees may be a possible solution. This paper, using a self-determination theory and self-socialisation framework, determines whether one girl group's, "geek girls", video gaming behaviour is associated with their choice of undergraduate degree by using two secondary datasets: a cross-sectional study of the Net Generation (n = 814) and the Longitudinal Study of Young People in England (LSYPE) dataset (n = 7342). Chi-square analysis shows that girls who were currently studying a PSTEM degree were more likely to be gamers and engage in multiplayer gamers. Further, using logistic regressions, girls who were heavy gamers (> 9 h/wk) at 13–14 years were found to be more likely to pursue a PSTEM degree but this was influenced by their socio-economic status. Similar associations with boys and PSTEM degrees were not found or were weak. Therefore, girls were self-socialising or self-determining their identity groups through gaming. This research can provide the basis for whether encouraging gaming in adolescent girls can help them onto PSTEM pathways.

1. Introduction

The challenge of encouraging adolescent girls to enter higher education for studying science, technology, engineering and mathematics (STEM) subjects particularly the physical STEM (PSTEM)[1] subjects has plagued both Western societies and educators as there has not been any significant increase in STEM participation rate for girls in the last decade (Smith, 2011; WISE, 2015). There is a recognition that this issue is multi-factored. Much of the research around girls and STEM subjects have focused mainly on how their socio-economic and parental background (Archer et al., 2012b; Cherney & Campbell, 2011; Rozek, Svoboda, Harackiewicz, Hulleman, & Hyde, 2017), their attitudes to STEM subjects (Barkatsas, Kasimatis, & Gialamas, 2009; Simpson, Che, & Bridges, 2016) and their STEM aspirations (Archer et al., 2013; Levine, Serio, Radaram, Chaudhuri, & Talbert, 2015) can affect their engagement.

Recent research has started investigated how stereotypes affect the STEM participation of girls (such as by Archer et al., 2012a; Cheryan, Siy, Vichayapai, Drury, & Kim, 2011; Master, Cheryan, & Meltzoff, 2016; Starr, 2018). STEM stereotypes are mainly associated with persons who are male, academically gifted, wear glasses and play video

games and who are sometimes referred to as geeks or nerds (Cheryan et al., 2011; Starr, 2018). Understanding how stereotypes can affect engagement may enable educators to create more effective interventions for their students. However, there is less understanding of how girls use current stereotypes to legitimise their participation in STEM studies. Some studies have shown that girls legitimise their STEM interests through harnessing the genius stereotype by emphasising their academic achievements (Archer et al., 2012a) or the appearance stereotype by appearing less feminine (Ong, 2005). There is less research, however, on how girls use the video gaming stereotype to legitimise their participation in STEM studies, although there are number of studies focusing on how video gaming can encourage girls into STEM studies (Appel, 2012; Feng, Spence, & Pratt, 2007; Gnambs & Appel, 2017). Therefore, this research paper extends this field by investigating whether a particular stereotype, that of the "geek girl" gamer, is associated with engagement in STEM, particularly PSTEM, subjects at the higher education level.

1.1. The geek girl stereotype

A geek means someone who has expertise in a certain field usually

to do with technology such as computer geeks, trivia geeks, gamers and hackers (McArthur, 2008). Males have stereotypically been associated with geek terminology and are popularised in the media as being good at PSTEM subjects (such as physics, engineering etc) as well as being particularly interested in video games. Take, for example, the popular US sitcom, 'The Big Bang Theory', the male actors portray geeks who are scientists in the PSTEM subjects and who are video gamers. The female actors who portray scientists are mainly in the biological sciences and are not gamers. In this media portrayal of scientists, there is a clear distinction of the roles of male and female scientists and their predilection to gaming, to the point where video gaming seems to occupy the male actors' lives. Salter and Blodgett (2012) explain that video gaming is a hypermasculine sub-culture where 'hardcore' gaming such as network/multiplayer games are the norm. Whilst there has been an increase in gaming amongst females, the perception of their gaming has mainly been around social or console-based games, for example, CandyCrush (IAB, 2014; Tomkinson & Harper, 2015). Even so, Padilla-Walker, Nelson, Carroll, and Jensen (2010) noted that girls were generally less likely to spend time on video games as well as play less violent games. For these reasons, girls are seen as casual gamers, that is, not having a complete time and energy commitment to their gaming. The hypermasculine sub-culture view these females gamers as not 'true' geeks and they are sometimes referred to as "geek girls", "girl geeks" or "fake geeks" (see Tomkinson & Harper, 2015 for a discussion on the terminology). It is these geek girls that this paper is interested in, in determining whether they are legitimising their participation in STEM through gaming.

1.2. Self-socialisation and self-determination theory

Whilst media can shape or influence the identity of the adolescent, the adolescent may seek out media that fits their evolving identity (see Coyne, Padilla-Walker, & Howard, 2013). Therefore, girls who are undertaking or intend to undertake a PSTEM degree are probably more likely to conform to the media's and society's construction of the geek by engaging in prolong periods of gaming and in particular hardcore gaming (or vice versa: girls who are gamers may feel the need to conform to studying PSTEM subjects). This is what Arnett (1995) refers to self-socialisation by media. Arnett (1995) explains that an adolescent forms their identity through partly trying to emulate persons or conceptualisations in the media and therefore, contributes to "the formation of occupational aspiration". Girls intending to do a PSTEM degree may then engage in more video gaming to feel part of the PSTEM community and provide legitimacy to their intentions (or vice versa).

This conception also aligns with the work of Deci and Ryan (2014) on self-determination theory (SDT) which suggests a person's intrinsic motivation are dependent on three psychological needs: relatedness, competence and supportive autonomy. Relatedness refers to the feeling of being part of a community, whilst competence indicates adolescents feeling capable and confident in achieving their goal whilst supportive-autonomy indicates students feel in control of the decisions they make and are supported in these decisions (Deci & Ryan, 2014; Kasser & Ryan, 1996). SDT, therefore, suggests that if an adolescent has a particular goal, such as doing a PSTEM degree, then they are more likely to be intrinsically motivated if they feel part of the community such as the PSTEM and video gaming community, having feelings of competence such as engaging with PSTEM subjects successfully and supportive-autonomy such as having the volition to select PSTEM subjects.

2. Hypotheses

Therefore, for girls who plan on undertaking PSTEM degrees, playing video games particularly hardcore video games that are representative of a science geek, may be a way of forming their identity (or vice versa). Boys, conversely, may not have the pressure of conforming to the hardcore video gamer stereotype when seeking to do

PSTEM degrees (or vice versa), as this is a legitimate domain of the adolescent boy. Recent studies suggest that there is some merit to this argument about video games and STEM degrees, for example, Turner (2014) found in her longitudinal cohort study that students who played video games were more likely to go on to do a STEM degree and confirmed that boys were also more likely to do a STEM degree. Further, Lantz (2015) noted in her cross-sectional study of undergraduate students that just under half felt that playing video games influenced their choice of STEM majors. However, both Turner and Lantz did not draw any association between the gaming intensity (i.e. time spent on gaming) and type of games by gender for the different types of STEM degree (biological sciences vs physical sciences). The degree type is an important distinction to make as girls often select biological STEM (BSTEM) degrees over PSTEM degrees (WISE, 2015). Further, for girls planning on studying a PSTEM degree and hence conforming to the gamer identity, then the expectation is that for girls, their time spent on gaming should increase over the years. Therefore, the research hypotheses for this paper are:

1. Girls who play hardcore video games (gamer type) are more likely to do a PSTEM degree
2. Girl's gaming intensity (hours spend on gaming) is positively associated with their likelihood of pursuing a PSTEM degree
3. An increase in girl's gaming intensity (hours spend on gaming) will be positively associated with their likelihood of pursuing a PSTEM degree

3. Design and overview of studies 1 and 2

The three research hypotheses are answered using a secondary data analysis approach. Secondary data analysis is not a statistical or analytical approach, but rather it is a methodological approach. In a secondary data analysis approach, the research uses data that is already in existence such as in a repository. Secondary data analysis offers a way of investigating research questions using larger datasets than which would be possible for the researcher otherwise, in terms of resources. Secondly, it allows research data to be used parsimoniously. However, secondary data has the issue of not always having the exact research data that is needed for answering research hypotheses and sometimes proxies must be used. In this paper, two secondary data sources are used. The first research hypothesis (Study 1) is answered using data from a cross-sectional survey from a UK Economic Social Research Council (ESRC) funded project on the Net Generation (see Hosein, Ramanau, & Jones, 2010; Jones & Hosein, 2010) during the first year of their university life. The second and third hypotheses (Study 2) are answered using data from a longitudinal cohort study, the LSYPE (Longitudinal Study of Young People in England) (see Anders, 2012) which collected data on the same adolescents from when they were 13/14 years to 19/20 years of age.

Both datasets have data related to gaming and degree type. However, the gaming data differs in both datasets. The Net Generation dataset has information on the game type (hardcore and softcore gaming) and degree choice. On the other hand, the LSYPE dataset has the number of hours played (gaming intensity) when the participants were 13/14 years and their eventual degree choice at 18 years but does not have information on the particular game type. The LSYPE dataset, also unlike the Net Generation dataset has the advantage of having data on those adolescents who did not go to university. Using these two datasets thus allows us to answer the research hypotheses related to the type (Study 1) and intensity (Study 2) of games and provide insights into how they are associated with degree choice of girls.

The theoretical framework of self-socialisation by media is applied to Studies 1 and 2, and the SDT framework is only applied to Study 2. Study 1 did not have any variables that would correspond to the SDT framework.