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Impact of social comparison on perceived online academic futility: A perspective from parents

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Abstract

In response to the wide-ranging concern of online academic futility, the current study aimed to explore the independent variables and mediating variable from a novel perspective of parents during COVID-19. Based on the social comparison theory and the control-value theory of achievement emotions, social comparison and tutoring anxiety were incorporated into an integrated model as predictors and mediator, respectively. A total of 300 parents completed an online survey. The results of the structural equation modeling indicated that upward social comparison and downward social comparison were both positively related to tutoring anxiety, which in turn positively predicted perceived online academic futility. Notably, tutoring anxiety played a significant mediating role in the association between different social comparison and perceived online academic futility. These results highlight the consistent predictive effect of upward social comparison and downward social comparison on perceived online academic futility, shedding light on the roles of tutoring anxiety in explaining the relationship from parental perspectives.

Keywords Social comparison · Tutoring anxiety · Perceived academic futility · Online learning

1 Introduction

The outbreak of COVID-19 pandemic has caused great disruption in the education systems around the world (Abdulla, 20202020). To effectively prevent and control the spread of COVID-19, and to ensure the safety and health of teachers and students, the Ministry of Education of China issued "*classes suspended but learning continues policy* " (Ministry of Education of the People's Republic of China, 2020) for the sake of coordinating and integrating teaching resources to guarantee the learning progress.

Extended author information available on the last page of the article

As a promising learning method, online learning has provided convenience for teaching and learning, but it has also created an uncertain and anxious environment for children and parents (Roy et al., 2020), which has triggered a series of issues.

The social comparison in quarantine state is likely to cause parental perceived online academic futility about their children. Social comparison theory argues that individuals have the motivation to accurately assess their own abilities. But in a highly uncertain environment, individuals cannot properly assess their own abilities, resulting in negative emotions (Festinger, 1954). Although online learning can help learners overcome the time - space barrier (Hong et al., 2021a), the quarantine situation may increase learners' learning uncertainty and amplify negative emotions, such as frustration, depression, and boredom (Do & Schallert, 2004; Pekrun et al., 2002), which brings a sense of learning inefficiency (D'Hondt et al., 2016). Similarly, the state of pandemic isolation reduces the effective evaluation criteria, so learners with social comparison tendencies may have a strong sense of ineffectiveness in online learning effects (e.g., learning status, learning progress, and academic performance) (Beale & Hall, 2007; Bokayev et al., 2021; Harjule et al., 2021). However, current research on this topic from the parental perspective is relatively insufficient.

In addition, the relationship between social comparison and parents' perceived online academic futility is underexplored. Compared with traditional in-person learning, parents play a role in providing remedial tutoring for their children in online learning tasks. When faced with challenging tasks, parents with different tutoring abilities will have distinct tutoring anxiety (Harjule et al., 2021). Parents' tutoring anxiety may be associated with their social comparison and perceived online academic futility. Frequent social comparison may produce negative emotions (e.g., anxiety, dissatisfaction, deprivation, anger) (Blanton, 2001; Crosby, 1976; Lockwood & Kunda, 1997; Olson et al., 1986) and reduce parents' happiness (Yen et al., 2020). At the same time, scholars point out that these negative emotions (e.g., tutoring anxiety) make parents doubt their children's online learning performance and reduce parental perceived online learning effects (Harjule et al., 2021). It can be seen that there is a mediating factor between social comparison and parental perceived online academic futility.

Community of Inquiry (CoI) Theory is a theoretical model of online collaborative inquiry learning. It consists of three basic elements, cognitive presence, social presence and pedagogical presence. Among them, social presence refers to the ability of participants to use media (social media) to express their "true self" (Garrison et al., 1999). Through online communication, their thoughts and ideas can be interconnected, and they can find their own identity, express their emotions, e.g., appreciation, commendation and question (Rourke et al., 2007). Similarly, in the online learning environment, parents also evaluate their children learning level by comparing with others and generate corresponding emotional experience. In addition, for a long time, research on online learning and instruction has primarily been focusing on cognitive aspects (Li, 2022; Yi, 2021). However, factors such as emotion and motivation, although having a long tradition in research on traditional learning environment, have largely been neglected in the study of online learning (Leutner, 2014). Against this background, Moreno (2006) proposed a "Cognitive-Affective Theory of Learning with Media" (CATLM), which expands Mayer's CTML by including the concept

of "affective mediation". The CATLM framework posits that the multimedia learning process is mediated by the learner's mood. Positive mood has a facilitating effect on multimedia learning, and negative mood had an adverse effect on learning (Liew & Tang, 2016). Consistent with the theory, parental tutoring anxiety in this study corresponds to the negative emotion, and its impact on online learning should be further explored.

Therefore, to explore the relationship between the parental perceived online academic futility and social comparison, this study collects data from parents through questionnaires and uses a structural equation model to verify the relationship between them. This is conducive to supplementing the evidence of the perceived online academic futility from the parent's perspective, revealing the reasons and influence mechanisms that affect parents' perceived online academic futility. The research will provide enlightenment for improving the online learning effect in practice.

1.1 Social comparison and perceived online academic futility

Academic futility was first introduced by Brookover and colleagues (Brookover & Schneider, 1975; Brookover et al., 1978). The academic futility mainly refers to the weak "sense of control" about their own learning environment (e.g., teachers, peers etc.) and academic performance (Brookover et al., 1981). Students with higher academic futility will produce higher feelings of hopelessness or lack of caring and give negative feedback. They would think that "people like me will never do well in school even though we try hard" (Brookover & Schneider, 1975; Brookover et al., 1978, 1981). Perceived online learning ineffectiveness refers to learners' negative evaluation of learning efficiency, concentration, learning state, learning engagement and other aspects after switching from face-to-face school learning to home-based online learning (Hong et al., 2021a; Liu et al., 2022). For example, the self-reported concentration, engagement, and ability to learn of pupils with higher perceived online learning ineffectiveness were significantly lower during online learning (Walters et al., 2021). Through a period of online learning, they feel uncontrollable about their academic achievement (e.g., academic performance), and even perceived that their academic performance has declined (Hong et al., 2021a; Korkmaz & Mirici, 2021). On the other hand, when they believe in their ability to use technology, their online learning intention will also increase (Doan, 2021). Therefore, the results concerning the relationships between online learning course and academic outcomes have been mixed (Jansen et al., 2020).

Although online distance learning has ample advantages in students' learning outcomes (Magalhães et al., 2020; Yang et al., 2020), there are some cons, e.g., absence of teacher's supervision and/or interaction, low learning engagement, which result in learning ineffectiveness or futility (Broadbent & Poon, 2015; He et al., 2022; Hong et al., 2021a). Among them, online academic futility has been attracting wide-ranging concerns. Specifically, the academic futility in online learning systems has appeared in several participants, such as college students (Hong et al., 2021a), high school students (Hong et al., 2021b) and middle school parents (Liu et al., 2022). Taken together, the above results consistently show that online academic futility warrants further examination.

Parents' social comparison is correlated to their perceived online academic futility in the era of internet. Festinger (1950) proposed a social psychological theory (social comparison theory) to explain interpersonal influence. People's definitions of their own social characteristics (such as ability, intelligence, etc.) are usually obtained by comparison with those around them, rather than obtained by objective criteria. Festinger calls this phenomenon social comparison. Subsequently, he proposed that individuals compare themselves with others when objective standards are lacking and suggested two comparison directions: upward comparisons and downward comparisons (Festinger,1954). In social comparison, upward comparison is that individuals compare themselves to those who are better than them (upward social comparison, USC). By contrast, downward comparison refers to the comparison with people who are worse than themselves (downward social comparison, DSC; Wood 1996). In addition, Rousseau argued that the principal source of human unhappiness was our tendency to make invidious comparisons with others (Garrard, 2014). Social comparison mainly produces two opposite responses to an individual's self-evaluation: the contrast effect and the assimilation effect (Blanton, 2001). More recently, the social comparison theory has been expanded to include motives for social comparison other than self-evaluation, including maintaining subjective well-being, restoring one's self-esteem by comparing oneself with others worse off (Suls & Wheeler, 2000; Taylor & Lobel, 1989), and self-improvement (e.g., seeking a positive example of the domain under evaluation) (Mcfarland, 2000; Wills, 1981). After analyzing the relationship between learners' upward comparison and self-concept which is opposite to academic futility, scholars pointed out that upward comparison was significantly negatively correlated with the clarity of the individual's self-concept (Zhang et al., 2020). That is, individuals with upward comparisons have relatively low self-evaluation and self-concept abilities (Moller & Koller, 1998). Similarly, downward comparisons also have negative impacts on individual's perceived learning effect, as it negatively affects students' academic self-efficacy (Bai et al., 2013). When an individual compare with other people, their negative emotions will be activated which in turn damage the individual's learning effectiveness (Moller & Husemann, 2006). These studies have shown that social comparison has negative impacts on the perception of individual learning effects, such as reducing learners' academic self-efficacy and learning efficiency. Parents, as special individuals in the family, may also conform to this regular pattern. For example, parents' frequent social comparisons can generate negative feelings on themselves (Mendes et al., 2017; Yen et al., 2020). as well as depression and frustration on their children (Lee et al., 2020), leading to negative evaluations of online learning. Social comparison theory has been studied and applied in a variety of domains including online environment (Choi et al., 2019; Esteves et al., 2021). In the 60-year meta-analysis presented by Gerber, the environment in which social comparison theory is adopted plays a role in the final research outcome, and emphasizes the importance of social comparison theory in various types of research (Gerber et al., 2018). Therefore, this study combines social comparison theory with the online learning environment to analyze the relationship. Within this context, this research hypothesizes: upward comparison positively predicts parental perceived online academic futility (H1); and downward comparison can also positively predict parental perceived online academic futility (H2).

1.2 Social comparison and parental tutoring anxiety

Upward comparison is seen as a potential antecedent predictor of parents' tutoring anxiety (Wills, 1981; Collins, 1996; Gentile et al., 2019). In educational research, anxiety mainly refers to the tension, worry, panic emotions of individuals in their learning progress, as well as the negative emotions caused by the uncertainty about their learning effect (Huang, 2004; Spielberger et al., 1983; Vitasari et al., 2011). Tutoring anxiety refers to a feeling of tension or discomfort in solving learning problems (Richardson & Suinn, 1972; Yang et al., 2021). It is a subjective emotional state experienced before or during a specific tutoring period related to the act of completing the tutoring itself, the threat of failure, and the perceived negative consequences of tutoring (Topping, 2019). The contrast effect in the upward comparison emphasizes that when others perform better than oneself, the individual will have negative emotions (Tesser et al., 1988), such as depression and anxiety (Butzer & Kuiper, 2006). Upward comparison can negatively influence mood when one's state is assessed as inferior to the targets (i.e., when a contrast effect occurs), because depressive effect and low self-evaluations tend to covary. Negative mood change would also be consistent with studies suggesting that upward comparison produces feelings of dissatisfaction (Collins, 1996). The Big-Fish-Little-Pond Effect occurs where students of equal ability have lower academic self-concepts when compared with those of higher ability (Marsh & Hau, 2005). For example, when an applicant faces other job applicants who are well-dressed and of high-capacity, their self-evaluation level will decrease (Blanton, 2001). The online communication has become popular in recent years, within the context of Chinese culture scholars have analyzed the relationship between the upward comparison of adults and their emotional experience. The result showed a positive association between upward social comparison and negative emotion such as depression, dismay, envy (Wang et al., 2020; Xing et al., 2022). It can be seen that upward social comparison has a negative impact on the comparator, making individuals have lower self-evaluation and higher negative emotions. When individuals perceive that their peers have made greater progress than themselves, it will affect their self-esteem, self-confidence and self-evaluation (Lee, 2014), and then generate depression, anxiety and other negative emotions (Appel et al., 2016; Sidani et al., 2020). Furthermore, parents' emotions directly affect their children's moods. Therefore, combined with parental tutoring in the environment of the pandemic, the current research takes parental tutoring anxiety as a factor, and explores the relationship between social comparison and parental counseling anxiety. Based on the above analysis, this research includes a third hypothesis: parents' upward social comparison positively predicts their tutoring anxiety (H3).

Downward comparison may positively predict parents' tutoring anxiety. The assimilation effect of downward comparison points out that individuals can reduce their self-evaluation level when facing downward comparison information (Blanton, 2001). For example, an individual think that he is as unhappy as the comparison target, they will become anxious and lower self-evaluation (Lockwood, 1997). Prior studies found that people with chronic diseases show more upward contrast and downward assimilation tendency. Compared with those who suffered worse than themselves, they increased the risk of fear and anxiety (Cabrera-Perona et al., 2017;

Cantero et al., 2020). There is also a significant positive correlation between teacher burnout and downward comparison. In general, when teachers compare themselves with unlucky peers, their burnout would increase (Gigasari & Hassaskhah, 2017). This also shows that in comparison with another human who is in a worse situation, a person's situation may become worsened, and they will have a negative emotion such as fear and anxiety. This phenomenon can be interpreted as a downward comparison predicting a worse future, not a guarantee of a person's superiority. Scholars in China have analyzed the relationship between social comparison and self-evaluation, and pointed out that there has been an assimilation effect on downward interpersonal social comparison. The downward comparison of students has an assimilation effect, which can reduce their self-evaluation (Xia et al., 2021). In addition, downward comparisons (i.e., comparisons with inferior targets) elicit feelings of social distress (Zheng et al., 2022). In the online education background, parents will increase their concerns about their children's online learning quality, after comparing their children with others who are maladapted to online learning. Based on the above discussion, this study proposes a fourth hypothesis: parents' downward social comparison may positively predict their tutoring anxiety (H4).

1.3 Parental tutoring anxiety and perceived online academic futility

There may be a positive correlation between parental tutoring anxiety and the perceived online academic futility. Achievement emotions are defined as emotions tied directly to achievement activities or achievement outcomes. The enjoyment arising from learning, boredom experienced in classroom teaching, or frustration and anger when dealing with difficult tasks are activity-related achievement emotions (Pekrun, 2002). Anxiety, as activity-related achievement emotion, affects students' cognitive process and behavioral decision-making (Pekrun et al., 2011). The proposal and development of the control-value theory of achievement emotions are mainly influenced by the expected value theory. On this basis, Pekrun (2000; 2006) put forward the basic hypothesis of achievement emotion and the control value theory of achievement emotions. The control-value theory of achievement emotions explicitly indicates the conception of achievement emotions. In addition, the control-value theory of achievement emotions provides an integrative framework for analyzing the antecedents and effects of emotions experienced in achievement and academic settings. The factors about antecedents mainly include personal factors, task and environmental factors, appraisal factors. At the same time, achievement emotion affects individual achievement and behavioral performance, such as cognitive strategies, self-management strategies and so on (Pekrun & Elizabeth, 2010; Pekrun et al., 2002). The theory emphasizes the influence of academic emotions on learning motivation and academic performance. Pekrun (2002) believes that emotions can regulate cognitive processing and behavior, and interfere with decision-making reasoning and problem solving. Specifically, positive emotions play a coordinating and organizing role in the cognitive process, which can improve the learning effect, while negative emotions play a destructive and blocking role in reducing the learning effect.

The self-regulated learning (Artino, 2009a, b) based on the control-value theory of achievement emotions theory points out that academic emotion is one of the fac-

tors predicting students' academic performance in the online learning environment (Ainley, 2006; Goetz et al., 2012). A study on students' emotions and academic performance shows that students' anxiety has a negative predictive effect on academic performance, and anxiety is significantly negatively correlated with self-efficacy (Daniels et al., 2009; Hembree, 1988). The emotions about learning are directly related to learning performance and have been recognized as critical to learners' learning effectiveness in the online learning context (Wu et al., 2021). Therefore, it is critical to analyze the impacts of emotions. In a meta-analysis of the relationship between academic emotions (positive emotion, negative emotion) and academic performance among mainland Chinese students, the results showed that there is a significant negative correlation between negative emotions (anger, anxiety, hopelessness, depression, etc.) and academic achievement (Lei & Cui, 2016). In addition, in a study about whether emotions have influence on Chinese students' online learning engagement, the results showed that negative emotions had a significant negative effect on online learning engagement (Artino, 2009a; Deng et al., 2022). As the guardians of students, parents also have unknowns and uncertainties about the new learning approach. As their anxiety increases, their sense of ineffective online learning may increase accordingly. In online learning, learners are in the state of human-computer interaction for a long time, unable to effectively assess learning, and prone to fatigue and learning anxiety, which in turn affects the effectiveness of online learning. Therefore, the research combines the control-value theory of achievement emotions with the online learning environment and analyzes how academic emotions affect individuals' perceptions and judgments. Based on the above theories and research results, this study proposes a fifth hypothesis: parents' tutoring anxiety can positively predict parental perceived online academic futility (H5).

1.4 Demographic characteristics and perceived online academic futility

Parents' demographic background factors may affect their perception about children's online learning outcomes. When faced with the same learning content and at the same level as others, women consistently rate their ability to understand and perceive lower than men. They develop a sense of shame and helplessness (Pekrun, 2006). Similar studies have pointed out that women's self-efficacy beliefs are significantly lower than men (Hendricks et al., 2015). Compared with other hierarchy parents, middle-class parents encourage children to read printed books for learning (Oconnor & Fotakopoulou, 2016). It can be seen that both gender and socioeconomic status may affect parents' attitudes towards online learning. Prior studies have highlighted the association between online learning outcomes and demographic characteristics that have been found to be important for online learning process and age (Rafique et al., 2021). One study found region and the level of economic development to be predictors of online learning outcomes. (Rizvi et al., 2019). Based on this parents' educational background, socio-economic status, gender, age and other information are considered as control variables in this study.

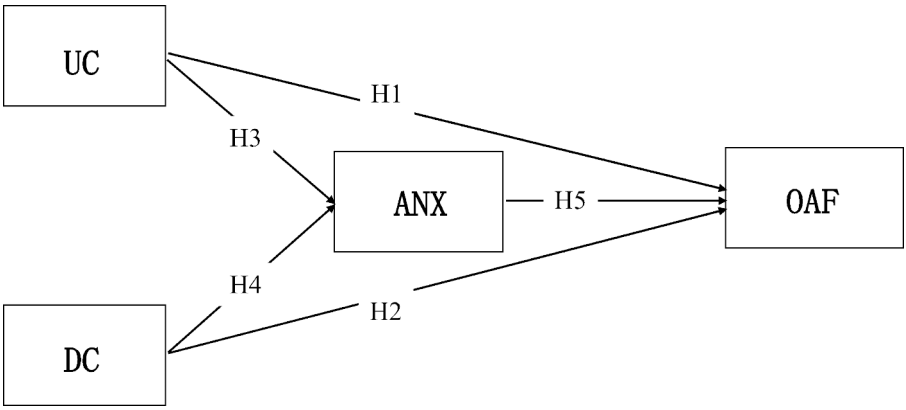

Fig. 1 The hypothesis model
Note UC = Upward social comparison, DC = Downward social comparison, ANX = Parents' tutoring anxiety, OAF = Perceived online academic futility

1.5 Present study

Based on the above evidence, it is found that the following gaps are worthy of further study. Firstly, the relationship between parents' social comparison and the perceived online academic futility is not clear. Secondly, the mediator mechanism between social comparison and the perceived online academic futility needs to be further explored. Thirdly, parents play an important role in student learning (Luo et al., 2011), but there are currently few empirical studies examining the effect of online learning from the perspective of parents. Since parents' attitudes directly determine their supportive behavior for children's online learning, it is very valuable to explore the relationship between parental perceived online academic and social comparison (Waters & Leong, 2014). Therefore, this research takes the online learning of "*classes suspended but learning continues policy*" as the background, and is based on the social comparison theory and the control-value of achievement emotions theory. Furthermore, the mediating mechanisms that influence parents' perception of online academic uselessness are explored, and the following hypotheses are proposed (see Fig. 1):

Hypothesis 1 Upward comparison positively predicts perceived online academic futility;

Hypothesis 2 Downward comparison positively predicts perceived online academic futility;

Hypothesis 3 Upward comparison positively predicts tutoring anxiety;

Hypothesis 4 Downward comparison positively predicts tutoring anxiety;

Hypothesis 5 Tutoring anxiety can positively predict parental perceived online academic futility.

2 Methods

2.1 Procedure

The study was conducted in accordance with standard procedure. We randomly selected 300 parents whose children study in two public secondary schools. We used the method of simple sampling to randomly select these two public secondary schools from some partner schools distributed in Beijing and Shandong Province. Because Beijing and Shandong represent the upper- and middle-income regions of China, respectively, we randomly selected a school each from these two regions as the sample school. Then, 150 parents of students were randomly selected from each of the sample schools.

These parents were invited to understand the research principle (i.e., no-harm principle, confidentiality principle, right of informed consent) and to complete the questionnaire from April 20 to April 30, 2020. These questionnaires were released using *the Questionnaire Star online questionnaire platform* (https://www.wjx.cn). Parents who participated in the survey said that their children were currently learning online. The study has obtained an approval from the Academic Ethics Committee of the researchers' institution.

2.2 Participants

To achieve our research aim, we recruited 300 parents from Beijing and Shandong province in China using the online questionnaires. Due to the rigorously design and carry out, such as building long-term cooperation, emphasizing the significance of survey, and setting up a lottery in the questionnaire, all participants completed the online survey timely with no loss of samples. Since almost all secondary schools in China are public schools, the schools selected are also public secondary schools, which means that they are largely homogeneous, and the parents of the two sample schools can represent the parents of the majority of schools. Among these parents, 19.7% were fathers and 80.3% were mothers. The basic demographic information including age, education background, and monthly household income were displayed in Table 1. To exclude the influence of those confounders, we incorporated them as control variables in the analysis section.

2.3 Measures

2.3.1 Social comparison

Patents' social comparison was measured using a psychometric method, namely the Social Comparison Scale which includes upward social comparison and downward

Table 1 Demographic information

Age	≤30	31–35	36–40	41–45	≥46
N (%)	21 (7.0%)	155 (51.7%)	54 (18.0%)	58 (19.3%)	12 (4.0%)
Educational background	**≤ Primary School**	**Junior High School**	**Senior High School**	**University/ College Degree**	**≥ Postgraduate**
N (%)	37 (12.3%)	161 (53.7%)	62 (20.7%)	39 (13.0%)	1 (0.3%)
Monthly household income (yuan)	**≤1999**	**2000–4999**	**5000–9999**	**10,000–19,999**	**≥20,000**
N (%)	39 (13.0%)	118 (39.3%)	119 (39.7%)	20 (6.7%)	4 (1.3%)

social comparison (Brown et al., 2007). The scale consisted of eight items and its validity was verified by previous evidence in the Chinese context (Yang et al., 2021). Participants reported degree of agreement on a 5-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores indicated higher levels of upward social comparison or downward social comparison. The results of Cronbach's α for the upward and downward social comparison scales were 0.824 and 0.932 separately, which both supported good internal consistency.

2.3.2 Parents' tutoring anxiety

The revised Anxiety Scale was used to measure the tutoring anxiety of parents (Dowker et al., 2016). The scale consisted of five items (e.g., "*When I was helping my child with his/her homework for home online learning, I would feel uneasy if it was too difficult*"). Participants were asked to respond to each item on a 5-point Likert scale. After calculating the average score of the five items, higher scores represented higher levels of tutoring anxiety. This scale has been widely used in previous studies among Chinese patents (Yang et al., 2021). In this study, the Cronbach's reliability of the scale was 0.906.

2.3.3 Perceived online academic futility

The adapted questionnaire of perceived online academic futility was used to measure parents' feeling about futility of online learning (Hong et al., 2021a). The questionnaire included four items (e.g., "*Children's learning efficiency has decreased since online teaching*"). Responses were measured on a 5-point scale which ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). The average score of the four items was calculated, with higher scores indicating higher levels of ineffective feeling. In this study, the Cronbach's reliability of the scale was 0.940.

Table 2 Confirmatory factor analysis and normality (skewness and kurtosis) of each construct

	Suggested value	UC	DC	ANX	OAF	Measurement model	Structural model
χ^2	-	0.706	3.119	13.358	10.826	172.154	257.134
df	-	2	2	2	2	113	177
χ^2/df	<8	0.353	1.560	6.679	5.413	1.523	1.453
CFI	>0.90	1.000	0.999	0.991	0.992	0.984	0.978
TLI	>0.90	1.000	0.997	0.983	0.975	0.981	0.975
RMSEA	<0.08	0.000	0.043	0.017	0.121	0.042	0.039
SRMR	<0.08	0.006	0.007	0.075	0.010	0.044	0.045
Skewness	<2	-0.735	0.813	0.724	0.078	-	-
Kurtosis	<7	0.750	0.522	0.966	-0.613	-	-

Note. UC = Upward social comparison, DC = Downward social comparison, ANX = Tutoring anxiety, OAF = Perceived online academic futility

2.4 Item analysis

Table 2 shows that the values of χ^2/df of all constructs were less than the threshold value of 8 (Barra et al., 2019; Zeidan et al., 2019). Additionally, the comparative fit index (CFI), and Tucker-Lewis fit index (TLI) were above the threshold value of 0.90, and Root Mean Square Error of Approximation (RMSEA) was less than the threshold value of 0.08, which indicated that there was a good fit for each construct (Hu & Bentler, 1999).

2.5 Reliability and validity analyses

We examined the reliability (i.e., internal and composite reliability) and validity (i.e., convergent, discriminative and construct validity) based on confirmatory factor analysis. First, all of the Cronbach's α values in Table 3 were at least 0.824, surpassing the suggested threshold value of 0.6 (Hancock & Mueller, 2013). Moreover, all composite reliability (CR) values in the present study ranged from 0.831 to 0.940 and surpassed the suggested threshold value of 0.7 (Hair et al., 2010; Nunnally, 1978). Both of these indicated a good level of reliability.

Second, we further evaluated convergent validity by checking the average variance extracted (AVE) and factor loadings. All the AVE were larger than 0.5 and all the factor loadings were higher than 0.5, indicating acceptable convergent validity (Fornell & Larcker, 1981; Nunnally, 1978). Third, all factor loadings were statistically significant and ranged from 0.601 to 0.950, indicating an adaptable construct validity (Byrne, 2001). Fourth, Table 3 showed that all t-values were significant, which indicated that all items were discriminative and were able to identify the degree of response for different samples. In light of the above evidence, the values of the reliability and validity of the research instruments were reasonable.

Table 3 Results of reliability and validity

Items	*M*	*SD*	FL	*t* value
Tutoring anxiety *M*=2.121 *SD*=0.717 Cronbach's α=0.906 CR=0.910 AVE=0.670				
1. If my child asks me questions about my after-school homework for online learning, I will be afraid and don't respond.	2.060	0.807	0.668	44.191
2. When I was helping my child with his/her homework for home online learning, I would feel uneasy if it was too difficult.	2.243	0.938	0.859	41.411
3. If my child wants to discuss the after-school homework of online learning with me, I will feel very uneasy.	1.997	0.729	0.833	47.425
4. When I tutor my children to complete the after-school homework of online learning, if I encounter controversial answers, I will be at a loss.	2.160	0.870	0.846	43.002
5. When I tutor my child to complete the after-school homework of online learning, I will worry that my child will question my opinion.	2.143	0.844	0.869	44.001
Upward social comparison *M*=3.418 *SD*=0.832 Cronbach's α=0.824 CR=0.831 AVE=0.554				
1. I often ask my child to learn from classmates who 'learn better than him or her'.	3.523	0.996	0.726	61.248
2. I often ask my child to understand how students who 'learn better than him (her) ' learn.	3.603	0.971	0.809	64.288
3. I often ask my child to compare with his or her classmates who 'study better than him or her', so that he or she feels that he or she needs to learn more from others.	3.497	1.036	0.821	58.452
4. I often ask my child to compete with students who are 'more talented than him (her) '.	3.050	1.107	0.601	47.732
Downward social comparison *M*=2.253 *SD*=0.912 Cronbach's α=0.932 CR=0.936 AVE=0.786				
1. When my child does not finish homework well, I will encourage him (her) compare with the students who are 'worse than him (her) ' to enhance his (her) confidence.	2.423	1.093	0.794	38.400
2. When my child does not finish homework well, I will let him (her) compare with the students who are 'worse than him (her) ' to reduce his (her) pressure.	2.267	0.993	0.932	39.547
3. When my child does not finish homework well, I will compare him (her) with the students who are 'worse than him (her) ', so that he (her) will not feel too ashamed.	2.180	0.979	0.950	38.588
4. When my child does not finish homework well, I will compare him (her) with the students who are 'worse than him (her) ' to make him (her) feel good.	2.143	0.934	0.862	39.747
Perceived online academic futility *M*=2.893 *SD*=1.011 Cronbach's α=0.940 CR=0. 940 AVE=0.796				
1. Children's learning efficiency has decreased since online teaching.	3.053	1.105	0.866	47.856
2. Children's learning self-confidence has decreased since online teaching.	2.767	1.075	0.890	44.568
3. Children's ability to deal with problems has deteriorated since online teaching.	2.827	1.093	0.903	44.807
4. Children's academic performance has deteriorated since online teaching.	2.923	1.123	0.910	45.078

Note.M=mean, *SD*=standard deviation, CR=composite reliability, AVE=average variance extracted, FL=factor loadings

3 Results

3.1 Correlation analysis

Table 4 Correlation analysis

	UC	DC	ANX	OAF
DC	0.044			
ANX	0.260***	0.275***		
OAF	0.117*	0.017	0.316***	
Gender	-0.071	0.006	-0.010	-0.071
Age	0.069	0.000	-0.074	-0.148*
Education	0.106	-0.037	-0.037	0.094
Income	0.062	-0.067	-0.064	0.010

Note.$^{***}p<0.001$, $^{*}p<0.05$

Table 5 Direct and indirect effect analysis

	UC			DC			ANX	
	β	95% CI	Effect size	β	95% CI	Effect size	β	95% CI
Total direct effect	-0.065		21.886%					
ANX	0.204**	[0.088, 0.339]		0.172**	[0.064, 0.296]			
OAF	0.022	[-0.175, 0.234]	20.183%	-0.087	[-0.239, 0.076]	79.817%	0.618***	[0.377, 0.915]
Total indirect effect	0.232		78.114%					
OAF	0.126**	[0.048, 0.229]	54.310%	0.106**	[0.036, 0.199]	45.690%		
Total effect	0.167		100%					

Table 4 presented the results of the correlation analysis. In the section of Pearson correlations, upward social comparison was significantly positively correlated with tutoring anxiety and online academic futility. Downward social comparison was significantly positively correlated with tutoring anxiety. Tutoring anxiety was significantly positively correlated with perceived online academic futility.

3.2 Model fit analysis

The fit indices of the measurement model were measured to ensure the quality of the SEM (Hu & Bentler, 1999). The results of the measurement model presented a satisfactory model fit, $\chi^2/df=1.523$, CFI=0.984, TLI=0.981, RMSEA=0.042, SRMR=0.044. These indices indicated that the structural model of SEM could be further verified.

Furthermore, the structural model was built to reveal the impact of parental social comparison on online academic futility. The results of structural model fitness showed that the model fit was very good ($\chi^2/df=1.453$, CFI=0.978, TLI=0.975, RMSEA=0.039, SRMR=0.045).

3.3 Path analysis and mediating analysis

Table 5 displays the results of direct and indirect effect as analyzed by using the bootstrapping method. As shown in Fig. 2 after controlling demographic variables, the results of direct effect indicated that upward social comparison was positively related

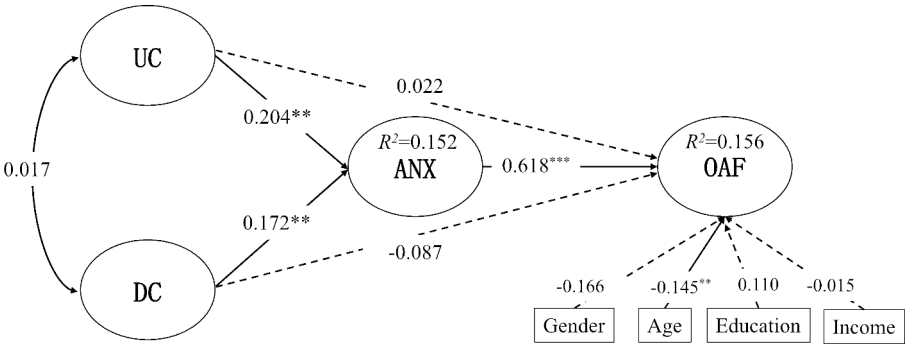

Fig. 2 Results of the research model

to tutoring anxiety ($\beta = 0.204^{**}$), and downward social comparison was also positively related to tutoring anxiety ($\beta = 0.172^{**}$); tutoring anxiety was positively related to online academic futility ($\beta = 0.618^{***}$). However, both upward social comparison and downward social comparison were not significantly correlated to online academic futility ($\beta = 0.022$; β = -0.087). As for the indirect effect, the effect of upward social comparison on online academic futility is 0.126 ([0.048, 0.229]), and the effect of downward social comparison on online academic futility is 0.106 ([0.036, 0.199]). Additionally, each 95% confidence interval (CI) did not include zero, which indicated that there was indeed a mediator between the two types of social comparison and online academic futility via tutoring anxiety (see Fig. 2).

According to the suggestion of Hair et al. (2009), all variables of this research had an acceptable predictive power. Figure 2 revealed that the effects of upward social comparison and downward social comparison on tutoring anxiety were medium, and the effect sizes were also medium on the online academic futility.

With regard of the demographic variables, parental age was negatively associated with online academic futility ($\beta = -0.145^{**}$), while gender, educational background, and monthly household income were not significantly associated with online academic futility.

4 Discussion

The control-value theory of achievement emotions believes that emotions can regulate individual performance. The theory points out that environment affects individual appraisal (control and values), and different appraisal can produce different emotions (achievement emotion, activity emotion and outcome emotion), which will ultimately affect performance. In this study, parental tutoring anxiety, a negative emotional experience, belongs to *emotion*, and perceived online academic futility (parental subjective reflection of children's learning performance) relates to the *performance* of control-value theory of achievement emotions. In addition, in combination with social comparison theory, it can be concluded that social comparison is the antecedent of learning ineffectiveness. Therefore, social comparison as a self-evaluation appertains to the *appraisal* of control-value theory of achievement

emotions. Building on Festinger's work, Buunk & Ybema (1997) present the social comparison identification-contrast model, which outlines that upward and downward comparisons produce either positive or negative feelings, depending on whether an individual identifies or contrasts themselves against a comparison target. This study combines the online learning environment, divides the parental social comparison into two directions (upward comparison and downward comparison), and to explore the influence of parents' social comparison on their emotional experience.

The current research combines social comparison theory and control-value theory of achievement emotions as the theoretical basis and research framework, develops three scales for social comparison, tutoring anxiety and perceived online academic futility, and explores the relationship among them. This research re-examines the effect of students' online learning from the perspective of parents, which not only expands the application fields of social comparison theory, but also verifies the indirect effect of academic emotions on the perception of learning effects. Specifically, the following conclusions are drawn.

4.1 Social comparison has no significant effect on parents perceived online academic futility

The result does not support hypothesis 1 and hypothesis 2, which means that it is not significant to verify the direct predictive effect of the upward and downward comparisons on the parents' perceived online academic futility. Social comparison related studies have shown that the effect of comparison on individual self-evaluation is not directly generated and needs to be functioned through other intermediaries (Teng et al., 2018). As hypothesized, parents' social comparison cannot directly predict their perceived online academic futility, social comparison produces tutoring anxiety (Appel et al., 2016; Cantero et al., 2020), and tutoring anxiety increases parents' perception of online academic futility (Artino, 2009a). That is, social comparison needs to rely on emotional intermediaries (such as tutoring anxiety) to predict the parents' perceived online academic futility. Consistent with the proposal, the research points out that the individual's sense of belonging within the group plays a mediating role between social comparison and self-efficacy (Kuo & Yang, 2018), and learners with higher sense of belonging are more likely to obtained positive emotions (Prati et al., 2018). Namely, there is an indirect relationship between social comparison and the sense of individual effectiveness. Similarly, studies about the relationship between social comparison and self-efficacy show that self-efficacy is more influenced by self-perception than directly controlled by social comparison (Steyn & Mynhardt, 2008). Similarly, learners' perception of online learning achievement is greatly influenced by students' emotional experiences, the emotions (such as anxiety and boredom) can make them resistant to online learning (Stephan et al., 2019). Therefore, there is no significant relationship between social comparison and the perceived online academic futility, which need to be mediated by emotions, such as parental counseling anxiety. In the follow-up part of this study, the emotional mechanism of parents' social comparison affecting their perceived online academic futility is further discussed.

4.2 Social comparison positively predict parents' tutoring anxiety

The study supports hypothesis 3 that upward comparison increases parents' tutoring anxiety. The result is similar to the view that "upward comparison makes individuals feel nervous, anxious (Emmons & Diener, 1985; Fox & Kahneman, 1992), and oppressive (Crosby, 1976)". They belong to research cases where individuals have a series of negative emotions due to upward comparison. Wheeler allowed participants to record their psychological changes when they compared themselves with others, and participants recorded that they felt anxious during the upward comparison (Suls & Wheeler, 2000). Due to the outbreak of the epidemic, province organized home online learning in primary schools, parents were undertaking most of the homework guidance work, and their tutoring anxiety were also increased with upward comparison. For example, compared to other students with excellent academic performance, parents often feel powerless and anxious when tutoring their children's homework, they believed that their own knowledge was not enough to improve their children's academic performance (Yang et al., 2021). Therefore, the upward comparison strengthens the parents' tutoring anxiety.

This study conforms to the content of hypothesis 4, the downward comparison positively predicts parents' tutoring anxiety. As indicated in the previous study, Gentile (2019) pointed out that downward social comparison was not helpful in alleviating anxiety, and even had the opposite effect, that is, enhancing anxiety. The study supports and expands the findings of Markus and Nurius (Markus & Nurius, 1986) that the anxiety emotion caused by the downward comparison occurs in the patient as well as in the parents. The research conclusion is also consistent with the assimilation effect theory. When the comparison object is found to be lower than their own level, individuals can involuntarily lower their self-evaluation and move closer to the comparison object. Therefore, when parents made downward comparisons, they believed that their children could also become worse, thereby increased tutoring anxiety. It can be seen that the downward comparison also increased the parents' tutoring anxiety.

4.3 Parents' tutoring anxiety positively predict perceived online academic futility

The research hypothesis of "Parents' tutoring anxiety positively predicts perceived online academic futility" has been verified. If an individual generates anxiety during the learning process, the negative emotion can in turn produces a sense of learning inefficiency (for example, a sense of frustration) (Lockwood, 1997). Researchers have estimated that at least 11% of adults experienced severe mathematics anxiety when tutoring children in math (DiStefano et al., 2020). Anxiety may damage the individual's learning attention and performance (Donelan & Kear, 2018; Hilliard et al., 2020; Schunk, 2008), and predict individual's learning outcome. Emotional anxiety in online learning can reduce participation in online courses (Bolliger & Halupa, 2012). Anxiety has a negative impact on their academic performance, which means students with higher anxiety about online learning are less engaged in online learning (Cheng, 2013). Prior studies from the students' perspective have found that students' learning status affected their parents' perception about their learning effects. If one

person has a poor academic performance, their parents have a low expectation and perception for their academic achievement (Shifrer, 2013).

From the perspective of parents, this study found that parents' tutoring anxiety also indirectly mediated the relation between their social comparison and their perception about children's online academic futility. According to the results of percentage of variance in perceived online academic futility that is explained by direct variable (i.e., social comparison) and indirect variable (i.e., tutoring anxiety), the total indirect effect (78.114%) is larger than total direct effect (21.886%). These results indicated that the prediction of social comparison on online academic futility mainly works primarily through the mediation of tutoring anxiety. This inspires parents to counteract the negative effects of social comparison on online academic futility by alleviating tutoring anxiety, rather than directly addressing social comparison.

4.4 Parental demographics influence on perceived online academic futility

This study takes parents' gender, age, educational background, and income into consideration, and the result shows that parents' age is related to the perception of online learning. As students grow older and have more experience about participating in online learning activities, their attitudes toward online learning become more positive (Hilton et al., 2020). Similarly, as an emerging learning method, it may take time to be accepted by the public. In addition, as individuals grow older, their attitudes toward emerging things could change, and they could gradually enjoy the convenience brought by online learning. Therefore, parental age has negative influence on perceived online academic futility. As the research results, among all demographic data, age is significantly associated with the level of satisfaction of online learning (Kumar et al., 2021). In a study about online learning satisfaction survey and online learning self-efficacy report, the result pointed out that participants aged 35 and above had higher scores than younger participants (Jan, 20152015). This study also found that there was a significant negative correlation between the parents' age and the perceived online academic futility.

Meanwhile, the result showed that parents' educational background, socio-economic status, and gender have non-significant influence on perceived online academic futility. One study result showed that learners have the same online-learning level, regardless of the sociodemographic background and educational background (Kintu et al., 2017). In online learning environment, the study provided evidence that inductive reasoning differs with age, and is independent of students' gender and socio-economic status (Mousa & Molnar, 2020). All participants (male and female) were equally engaged in their learning in the asynchronous courses and equally perceived the needs to support online learning (Ismailov & Chiu, 2022). Gender was not found to predict perceived e-learning stress significantly, as the government has achieved remarkable progress on gender equality, women's educational enrolments, and empowerment (Kabir et al., 2021). Therefore, no significant gender differences are found in this study.

4.5 Research Implications

Theoretically, first of all, the adolescent online learning quality was evaluated from learner's self-report by a previous study (Lemay et al., 2021). The current research emphasized the value of parental roles, evaluated the adolescents' online learning quality from the perspective of parents. The research highlighted the importance of parents' perception of the effectiveness of children's learning, and provided different research perspectives for online learning. Secondly, this research put forward the concept of parental perceived academic futility and conducted an operational measurement of it. Finally, guided by social comparison theory (Stefano et al., 2020), the current study built on previous research by simultaneously examining the relationship between social comparison (upward social comparison and downward social comparison) and parental perceived academic futility. This study revealed the emotional mediation mechanism between social comparison and perceived academic futility. The role of social comparison needs to be mediated by emotions (such as tutoring anxiety). This discovery expanded the application boundary of social comparison theory.

In practice, this research provided important information for parents to guide children's online learning. Studies have shown that parents need to reduce their tutoring anxiety by reducing social comparison, to provide the best possible guidance for their children. In addition, teachers and schools should take actions to help parents relieve their tutoring anxiety and increase their trust and security in online learning. Understandably, parents have many concerns about the new learning methods. As for teachers and school leaders, they should help parents ease their anxiety, resolve their concerns, and give full play to the advantages of online learning.

4.6 Limitations and future studies

Several limitations require consideration. Firstly, the questionnaire's lottery setup has its own limitations, which can change the motivation of the participants and affect their willingness to cooperate. In addition, it can distract the participants' attention, and affect the answering effect. For example, participants pay more attention to the results of the lottery rather than the questionnaire itself. Similarly, the indicators collected by self-reporting methods are subjective and can only explain the correlation between variables but cannot explain the causal relationship. Secondly, this study collects as many samples as possible based on parents' personal information, but the sample size remains limited. There is a deviation in the sample selection. As mothers have more support for their children's academic tutoring than fathers in China, this study samples were largely comprised of children's mother, which may cause errors in the results. Future studies may separate the influence of father and mother, exploring the relationship among social comparison, tutoring anxiety, and the perceived online academic futility from the perspectives of the different parents. Parental professional demographic information should be added to improve the representativeness of the sample. In addition, this study did not integrate parents' occupation, income, and educational background as socioeconomic status (SES) factors to analyze its impact on variable. So, the SES factors should be considered in future studies. Finally, although

the questionnaire survey method was appropriate to obtain relevant data and information from an objective level, such as social comparison, perceptions of parenting and tutoring anxiety, using other measurements can provide additional information and make the results more accurate. Further studies are desired to add other types of research methods (such as observation methods, interview methods) to expand the research dimension and supplement the multi-modal data receiving methods.

5 Conclusion

Based on the social comparison theory and the control-value theory of achievement emotions, social comparison and tutoring anxiety were incorporated into an integrated model as predictors and mediator. The research concluded that upward social comparison and downward social comparison both positively predicted tutoring anxiety, and were positively related to parental perceived online academic futility. The study validated the mediating role of tutoring anxiety between different social comparison and perceived online academic futility. The stimulus-organism-response model (S-O-R model) states that various external environmental factors (stimuli) can affect individuals' internal cognitions and affects (organisms), further driving their behavioral outcomes (responses) (Dhir et al., 2018). Though this theory was first used in the field of environmental psychology, it has been applied to studies on technology adoption and online behaviors recently. For example, online communication causes individuals to face a state of information overload. Then, individuals could have negative social comparisons and negative emotions (e.g., stress, anxiety and perceived service satisfaction), which could reduce the individual's recognition of online communication (Appel et al., 2016; Niu et al., 2018, 2020).

Theoretically, the research put forward the concept of parental perceived academic futility, and emphasized the value of parental roles, evaluated the adolescents' online learning quality from the perspective of parents. In addition, the results revealed the emotional mediation mechanism between social comparison and perceived academic futility. This study evaluates online learning from an adult perspective, and theories commonly used in research from similar research perspectives include self-determination theory (Haukas et al., 2022; Hsu et al., 2019; Luo et al., 2021), social learning theory (Costello et al., 2021; Crane & Comley, 2021; Gong et al., 2020) and activity theory (Maimaiti et al., 2021; Wang et al., 2019). These theories are not mutually exclusive. For example, the social comparison theory in the study and the social learning theory mentioned above analyze online learning from a sociological perspective. From this perspective, the theoretical basis of this study is broadened and strengthened. However, this study has a distinct research perspective and a variety of variable factors. This study evaluates students' online learning outcomes from a parent's perspective, a deviation from prior empirical research from the perspective of students or teachers. In addition, the study includes three variables, social comparison, parents' tutoring anxiety, and perceived online academic futility, and is based on the social comparison theory and the control-value theory of achievement emotions to explore the relationship between them.

In practice, parents should reduce social comparison and pay more attention to the development of their children. With the popularization of "Internet + education", people's daily life and learning methods are contrary to the traditional model. While the transformation brings convenience to individuals, it also brings serious challenges to students' learning and development (Luo & An, 2022). Under the situation of inevitable change, individuals should adjust their state to meet the change. The result of this study suggests that reducing social comparison can reduce parental tutoring anxiety and the perceived online academic futility. Therefore, this research has a great impetus for making full use of the convenience brought by online learning. Schools and teachers should help parents ease their anxiety, resolve their concerns, and explore and make full use of the online learning convenience to help students make progress.

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Declarations

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Ethics approval In order to conduct the study, the approval was obtained from the Ethics Committee and before the data collection process, Informed consent was obtained from the Participants.

Consent to participate All participants informed consent form.

Consent for publication The author agrees to publish this article in the Education and Information Technologies.

Informed consent All participants informed consent form.

Ethical Considerations There are no ethical issues in this article and before the data collection process, Informed consent was obtained from the Participants.

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