A Serial Mediation Model Testing Family Interaction, Anxiety, and Zest for Life as Predictors of Perseverance of Effort

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Abstract
Perseverance of effort, an individual long-lasting exertion to achieve a long-term goal even when facing obstacles (Duckworth & Quinn, 2009), has been consistently supported as a key indicator of subjective well-being and success. Due to the profound and significant role of perseverance of effort across the literature (Salisu et al., 2020), it is important to investigate potential factors that contribute to perseverance of effort. In this study, we took a sociocultural perspective of perseverance of effort and examined this mechanism using a serial mediation model that included anxiety and zest for life. A total of 326 undergraduate students were included in a cross-sectional study and responded to an online survey package. After controlling for demographic covariates, the results of structural equation modeling with maximum likelihood and bootstrapping with 5,000 resamplings (95% confidence interval) supported that anxiety and zest for life mediated the association between family interaction and perseverance of effort in a sequential fashion. It can be claimed positive and warm family interaction is related to individual perseverance of effort, and this relation is mediated by anxiety and zest for life sequentially. Practically, in order to enhance individual perseverance towards long-term goal-striving, researchers and educators can incorporate strategies to foster improved family interaction and zest for life in interventions, further providing anxiety prevention strategies.

Keywords: Anxiety, Family Interaction, Serial Mediation, Zest for Life, Perseverance of Effort

Introduction

Perseverance of effort, an individual long-lasting exertion to achieve a long-term goal even when facing obstacles (Duckworth & Quinn, 2009), has been consistently supported as a key indicator of subjective well-being and success. Due to the profound and significant role of perseverance of effort across the literature (Salisu et al., 2020), it is important to investigate potential factors that contribute to perseverance of effort. Also, according to the literature, the internal mechanisms between family factors, particularly in focusing on family interaction and perseverance of effort have not been sufficiently studied. It remains unclear how we can help individuals build perseverance of effort through the lens of family influence. Therefore, this study aimed to investigate the internal mechanism and conditions that can promote individual perseverance of effort in a sample of Chinese university student sample. University students were targeted because this population navigates numerous major roles (i.e., struggling with self-identity) which put them at high risk for various mental illnesses (Lee & Gramotnev, 2007).

Family Interaction and Perseverance of Effort

Family interaction has been broadly characterized by warm and supportive behavior, open communication, and firm within a family system, while within a Chinese context, three components of family interaction have theoretically and empirically emerged: communication, mutuality, and harmony (Shek, 2002). Operationally, family communication refers to verbal and non-verbal information exchanged between family members, which enables family members to express their love and concerns to each other. Family mutuality refers to mutual care and concern among the family members that goes beyond a quid pro quo type of family interaction in which each member wishes to benefit from the other (Miller, 1986). Family harmony, as a cultural value of Asian Families, refers to the intensity of peace, happiness, and safety among the family members (Ip, 2014). From a view of Bowlby's (1982) internal working model, family is a fundamental factor that shapes individual mental representations (also called schemas) of self and of others. These mental representations are the template for interpretations or reactions to future events (Bowlby, 1982). For example, positive and supportive parenting significantly promoted individual positive schema toward their positive psychological development (Saleem et al., 2020). Particularly in the Chinese context which is rooted in the Confucian heritage cultures, a high cultural value has been placed on perseverance which is highly empathized as an essential factor for success, and Chinese families exert a great influence over the shaping of an effortful attitude among their children and encourage them to study hard for better future success (Fwu et al., 2016). Although this empirical evidence confirmed that family factors are related to individual perseverance of effort in striving for long-term goals. However, the internal mechanism is relatively underexplored. This study aimed to explore this mechanism and provided theoretical support for designing positive psychological interventions to improve the perseverance of effort.

Anxiety and Zest for Life as Mediators

Anxiety, one of the subjective experiences of negative emotional states and psychiatric disease, refers to a feeling of tension and worry, and is usually generalized as an overreaction to a threatening situation (Lovibond & Lovibond, 1995). One Chinese meta-analysis result indicated that the overall prevalence of anxiety symptoms among Chinese students was 24.0%, while the prevalence of anxiety among the university population was even higher

(26.0%, Zhang et al., 2021). According to the literature, family consistently acts as a crucial indicator of psychiatric disease (e.g., Ee & Arshat, 2017; Lam & Chen, 2022) that individual's perceived family as a source of social support that helps them to facilitate their development of coping strategies for stressful events and psychological well-being. Several correlational (Olson, 2021) and systematic review studies (Rapee, 2012) have indicated that unhealthy family interaction (such as poor or ineffective communication, and lower level of family harmony) contributes to the development of anxiety. In addition, anxiety has been found to decrease individual desire and limit motivation for long-term goal attainment (Fishbach & Labroo, 2007).

Zest for life, one of the character strengths and a positive attitude towards life, refers to strong willpower in life and approaching life with excitement and energy in showing a positive outlook on life (Seligman et al., 2005). Family has been considered an important sociocultural factor that facilitates individual positive character strengths and traits (Shubert et al., 2022). In contrast to life satisfaction and happiness, the conceptualization of zest for life includes vitality that covered both energy and enthusiasm and could predict individual and social well-being among the student population; that is, for example, zestful students tended to exhibit less social isolation, perceive better psychological well-being, and better perseverance of effort (Park et al., 2004; Lam, 2021). Plus, emotion has consistently shown its substantial influence on individual cognitive processes, especially motivating action and behavior, for example, individuals perceived attachment anxiety significantly predicted their attitude toward being humorous (Besser et al., 2012).

In sum, this study tested the two predicted mediators in the family interaction-perseverance relationship, while anxiety would precede zest for life. It is also assumed that individuals' perceived positive family interaction (i.e., better harmony) may diminish their anxiety level (i.e., feeling of tension towards threatening events), and this negative emotion influences their zest for life (i.e., the positive attitude towards life and being energetic), further leading to perseverance level.

The Present Study

Grounded on theoretical and empirical evidence, it is assumed that family interaction might affect individual perseverance of effort directly as well as indirectly through anxiety and zest for life in a Chinese context. By clarifying this assumption, this study can provide a comprehensive picture for showing the internal mechanism (anxiety and zest for life) of family interaction-perseverance of effort link which is lacking in the empirical literature. The following hypotheses were formulated (see Figure 1):

- H_1: Family interaction positively predicts perseverance of effort.
- H_2: Family interaction inversely predicts anxiety (H_{2a}), and positively predicts zest for life (H_{2b}).
- H_3: Anxiety inversely predicts perseverance of effort.
- H_4: Zest for life positively predicts perseverance of effort.
- H_5: Anxiety and zest for life operate as serial mediators between family interaction and perseverance of effort.

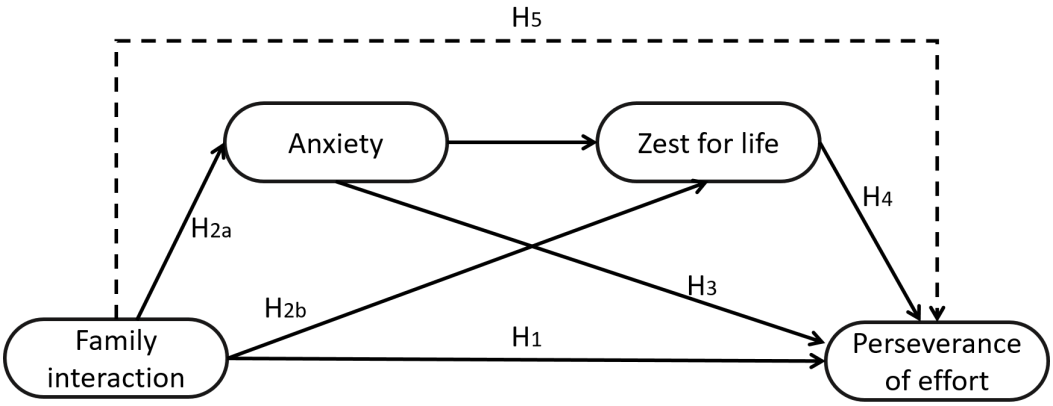

Figure 1: The Hypothesized Mediation Model.

Note: Solid lines represent direct paths and dashed lines represent indirect paths.

Method

Participants and Procedure

A convenience sampling method of correlational design was employed. We randomly issued a paper invitation on campus at a public university in Macau SAR, China. We also provided an informed consent with information explicitly stating the research purpose, nature, and procedure. No illegal information was collected from the participants, and they volunteered to participate in this study. Qualtrics was used to collect survey responses. A total of 335 students (aged between 18 to 31, $M = 21.15$, $SD = 2.51$; 68.06% female) accessed the online questionnaire and completed the questionnaire packages. Given the 2017/2018 student population composition in higher education in Macau (56.39% female, Tertiary Education Services Office, 2017), the current sample can be considered representative of the student population under study.

Materials

All the measurements were used in the Chinese validated versions showing good validity and reliability among Chinese samples.

Family interaction was assessed using the Chinese Family Assessment Instrument (C-FAI; Shek, 2002). The participants rated their perceptions of their family interaction in three dimensions—covering communication, mutuality, and harmony, with scoring range from 1 (*describes our household very well*) to 5 (*does not describe our household at all*); higher average score indicated a higher level of positive and warm family interaction. Shek (2002) showed that the C-FAI possesses good psychometric properties with its good factor structure for measuring family interaction in Chinese adolescent samples. The Cronbach's alphas for the three subscales were from .78 to .95, indicating an acceptable to excellent internal consistency.

Anxiety was assessed with the Chinese version of the State-Trait Anxiety Inventory (STAI-6; Hou et al., 2015). Six items about symptoms of anxiety were asked and rated on a 4-point Likert scale from 0 (*never*) to 3 (*almost always*); higher average scores indicated higher levels of anxiety. Good reliability and validity were supported in the Chinese samples (Hou et

al., 2015). A good internal reliability coefficient was shown in the current sample (Cronbach's alpha = .81).

Zest for life was assessed using the zest for life subscale of the Chinese version of the Values In Action Inventory of Strengths (VIA-IS; Duan et al., 2012). The original VIA-IS consisted of 24 subscales in assessing 24 different types of character strength; however, only the zest for life subscale was of interest in this study. Four items about zest for life were asked and rated on a 5-point Likert scale from 1 (*very much unlike me through*) to 5 (*very much like me*); higher average scores indicated higher levels of zest for life. The Chinese version of this zest for life subscale has shown good reliability and validity in a university student sample (Duan et al., 2012). A good internal reliability coefficient was shown in the current sample (Cronbach's alpha = .84).

Perseverance of effort was measured with four items from the Chinese version of Short Grit Scale (Duckworth & Quinn, 2009) that refer to students' consistent efforts in long-term goal striving. Each item was rated on a 7-point Likert scale from 1 (*not like me at all*) to 7 (*very much like me*); higher average scores indicated higher levels of perseverance of effort. The Chinese version of this scale was developed by the Duckworth research lab and has shown high reliability (Li et al., 2012). A good internal reliability coefficient was shown in the current sample (Cronbach's alpha = .80).

A set of demographic variables were collected in this study, including basic information (gender and age) and family socioeconomic status which was measured by Hollingshead's Two Factor Index of Social Position (Hollingshead, 1975). This index assessed parental socioeconomic status based on the education level and occupation of the parent who earns a higher income. According to Hollingshead (1975), the SES score of an individual is calculated by multiplying the scale value for occupation by a weight of 7 and the scale value for education by a weight of 4 in a raw score, ranging from 11 (higher socioeconomic status) to 55 (lower socioeconomic status), and these factor weights were calculated by the use of multiple regression equations. This formulation of SES is one of the most widely used measures of objective family SES level (Cooper et al., 2010). High SES was indicated by a score ranging from 11 to 29, medium SES was indicated by a score ranging from 30 to 40, and low SES was indicated by a score ranging from 41 to 55. In the current sample, the mean score of SES was 21.06 (SD = 10.10), indicating a high level of SES.

Statistical Analyses

IBM SPSS Statistics 24 was used to calculate the descriptive statistics and correlations of tested variables. Amos 24.0.0 was used to analyze the structural equation model (SEM) with maximum likelihood estimation (MLE) and this approach is able to account for all estimates of all the paths in the model and provide the fit statistics to evaluate goodness-of-fit in the model. To estimate good model fit (Hooper et al., 2008), comparative fit index (CFI > .90 acceptable), Tucker-Lewis index (TLI > .90 acceptable), root mean square error of approximation (RMSEA < .08 acceptable), and standardized root mean square residual (SRMR < .08 acceptable). Bootstrapping was used to test the mediating effect when the sample size is small and not normally distributed. The 5,000 bias-corrected bootstraps with 95% confidence intervals were performed to estimate the indirect effect and confirm the mediating effect.

Results

Preliminary Analyses

The ranges of skewness (from -.96 to 1.38) and kurtosis (from -1.38 to 1.50) for all the main variables were in the acceptable range for SEM of between -2 and +2 (Kline, 2010). Table 1 presented the descriptive statistics and bivariate correlations among variables. As expected, family interaction, anxiety, zest for life, and perseverance of effort had significant correlations with each other. Age and SES were significantly associated with all three dimensions of family interaction, while gender was only significantly associated with individual anxiety.

Variables	1	2	3	4	5	6	Gender	Age	SES
1. Communication	-						-.04	-.15**	.13*
2. Mutuality	.82***	-					-.02	-.20***	.12*
3. Harmony	.62***	.73***	-				-.01	-.12*	.12*
4. Anxiety	-.12*	-.14*	-.18**	-			.13*	-.06	-.09
5. Zest for life	.27***	.25***	.21***	-.31***	-		-.04	-.05	.06
6. Perseverance of effort	.28***	.23***	.28***	-.31***	.61***	-	-.08	.03	.02
Mean	3.43	3.83	3.76	1.56	3.53	3.45	.68	21.09	21.06
Standard Deviation	.84	.74	.77	.55	.79	.76	.47	2.41	10.10
Skewness	-.58	-.96	-.47	.19	-.29	-.14	-.79	.84	1.38
Kurtosis	.18	1.50	-.01	-.23	-.34	-.39	-1.38	1.03	1.28

Table 1: Descriptive Statistics and Bivariate Correlations among Variables (N = 332).

Note: SES = Socioeconomic status. *$p < .05$; **$p < .001$; ***$p < .001$.

Test of Measurement Model

A confirmatory factor analysis (CFA) using MLE on the variance/covariance matrices was used to estimate the reliability and validity of all of the main variables in this study. The measurement model revealed a poor model fit: $\chi^2(108) = 347.34$, $\chi^2/df = 3.22$, CFI = .92, TLI = .89, RMSEA [90% C.I.] = .082 [.072, .092], SRMR = .102. Notably, the factor loading of one anxiety item (*I feel content*) was only .20. Followed by Hair and others' (1992) suggestion for improving the fit of the measurement model, the items with factor loadings of .40 or below were removed from the analysis. The final measurement model fit was further improved: $\chi^2(94) = 266.60$, $\chi^2/df = 2.84$, CFI = .94, TLI = .92, RMSEA [90% C.I.] = .074 [.064, .085], SRMR = .079. All the parameter estimates were significant at the $p < .001$ level, and the standardized estimates for all items were acceptable, ranging from .41 to .97.

Test of Mediation Model

Figure 2 presented the mediation model which has been tested. The SEM with a maximum-likelihood estimation (MLS) was used to examine the hypothesized model, with controlling for demographic variables (gender, age, and SES). As shown in Figure 2, the hypothesized mediation model generated a good model fit: $\chi^2(130) = 309.74$, $\chi^2/df = 2.38$, CFI = .93, TLI = .91, RMSEA [90% C.I.] = .065 [.055, .074], SRMR = .070. All factor loadings of the indicator variables for each latent variable are significant at $p < .001$. Family interaction had a significant negative effect on anxiety and showed positive effects on both

zest for life and perseverance, anxiety had a significant negative effect on zest for life, and zest for life had a significant positive effect on perseverance.

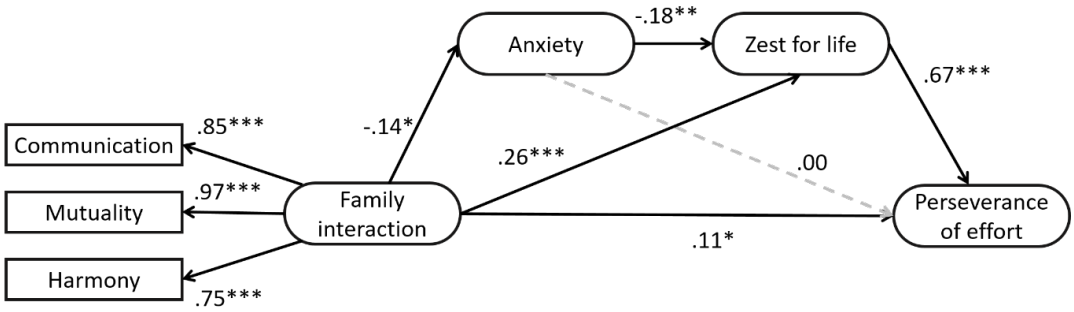

Figure 2: The final model (only the latent variables are presented in this figure).

Note. Solid lines indicate significant paths while the rounded rectangles indicate the latent variables. The effects were reported in standardized values. *p < .05; **p < .001; ***p < .001.

Further, we used Hayes' (2013) SPSS macro PROCESS (Model 6) with 5,000 bias-corrected bootstraps with 95% confidence intervals to examine the indirect effect of anxiety and zest for life separately, after controlling for gender, age, and SES. This approach allows the simultaneous examination of the indirect effect through up to four parallel mediators and provides pairwise comparisons between the proposed indirect effects (Hayes, 2013). The results showed that anxiety mediated the association between family interaction and perseverance (β = .02, 95% CI [.003, .042]), as did zest for life (β = .13, 95% CI [.065, .187]). The results also supported the serial mediating effect (β = .02, 95% CI [.006, .044]) explaining a total of 41% variance of perseverance of effort (R^2 = .01). We then conducted pairwise comparisons among the three indirect effects to test whether they exerted equal impacts on the association between family interaction and perseverance of effort (see Table 2). The results indicated that the indirect effect of family interaction on perseverance of effort through anxiety was significantly smaller than the indirect effect through zest for life (β = -.10, 95% CI [-.175, -.039]), while the indirect effect through zest for life was significantly greater than the serial mediating effect (β = .10, 95% CI [.032, .171]).

			Bootstrapping CI	
Effects	β	*SE*	Lower	Upper
Model 1: Family interaction ➔ Anxiety ➔ Perseverance of effort	.02	.01	.003	.042
Model 2: Family interaction ➔ Zest for life ➔ Perseverance of effort	.13	.04	.065	.187
Model 3: Family interaction ➔ Anxiety ➔ Zest for life ➔ Perseverance of effort	.02	.01	.006	.044
Contrasts				
Model 1 versus Model 2	-.10	.03	-.175	-.039
Model 1 versus Model 3	-.01	.01	-.029	.013
Model 2 versus Model 3	.10	.04	.032	.171

Table 2: The comparisons of indirect effects of family interaction through anxiety and zest for life on perseverance of effort (5,000 bias-corrected bootstraps 95% confidence intervals).

Note: Controlling for gender, age, and SES. β = Standardized Beta; *SE* = Standard Error; CI = Confidence Intervals.

Discussion

This is the first study to investigate the potential serial mediating mechanism in the association between family interaction and perseverance of effort. In support of H_1, results showed that family interaction was positively associated with the perseverance of effort in Chinese students. This aligned with previous findings that students who perceived positive family interactions and attachment security with their family members tended to show higher perseverance of effort (Lan & Wang, 2020). Further, family interaction was significantly associated with anxiety (supporting H_{2a}), and zest for life (supporting H_{2b}), suggesting that students' positive family interactions (i.e., better harmony) significantly decreased their anxious symptoms and promoted zest for life. This is in line with earlier research highlighting the important role of family interaction in promoting and predicting mental health in students (Bramlett & Blumberg, 2007). Surprisingly, the current findings did not indicate a significant association between anxiety and perseverance of effort (thus not supporting H_3). Studies have documented that anxiety can be a domain-specific construct (Lauer et al., 2018), and this study only investigated students' general anxiety levels. It is reasonable that students may have a higher tendency to be anxious about failing to achieve their goals. Further investigations are warranted.

The confirmed serial mediation model was found in favor of three indirect effects (Model 1 to 3), supporting H_5. Specifically, the indirect effect of family interaction on perseverance through zest for life (Model 2) had a significant and greater impact than the other two indirect effects (Model 1 and 3). First, this confirmed model is consistent with previous studies in highlighting the essential role of emotion in shaping individuals' attitudes and behavior (Besser et al., 2012), providing new insights into the different strengths of the indirect effects of emotions (anxiety) and attitude (zest for life) in the association between family influences (interactions) and behavior (perseverance in sustaining effort consistently). The current findings also showed that zest for life accounted for a significantly larger proportion of the total effect of family interaction on perseverance than anxiety. This implied that a positive attitude towards life could play a stronger role in explaining how positive and healthy family interactions are related to individual perseverance towards long-term goal-striving.

Limitations and Future Work

The current study should be interpreted in the context of three limitations. First, this was a cross-sectional study that failed to suggest causality among the tested variables. Second, the self-reported data may (1) cause a common-method variance, which may have allowed covariation between variables and produced significant bias in the results, and (2) include social desirability bias that the participants tend to present a favorable image of themselves. Therefore, multiple data resources are recommended in future studies. Third, this study only recruited a sample of Chinese university students, therefore, the current findings cannot generalize to other educational contexts, and non-Chinese populations or religions. More studies in this line with identifying other confounding factors such as the individual desire for goal-attainment and emotion regulation are highly recommended.

Implications and Conclusion

Theoretically, this study addressed a research gap by investigating and confirming the mediating role of anxiety and zest for life in the association between family interaction and perseverance of effort. The results provided a serial mediation path for understanding the role

of family interaction in cultivating perseverance of effort, which enriches the theory of positive youth development. Practically, in order to enhance individual perseverance towards long-term goal-striving, researchers and educators can incorporate strategies to foster improved family interaction and zest for life in interventions (such as writing day journals about using the zest character strength each day for two weeks; Proyer, Ruch, & Buschor, 2013), further providing anxiety prevention strategies. Since zest for life is still an emerging area of research in the school context, more studies targeting intervention development of zest for life can be fruitful in this research area.

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