



A Longitudinal and Multilevel Investigation of Grateful Climate in Cultivating Psychological Resilience: The Mediating Role of Athlete's Gratitude

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Abstract

For athletes facing high levels of pressure and experiencing significant psychological and physical demands, mere adaptation to the pressure is insufficient. They must also possess psychological resilience, which entails the ability to rebound from stressful conditions or even surpass their previous performance levels. Previous research has indicated that receiving unilateral positive support is one of the factors contributing to psychological resilience. Therefore, the objective of this study is to examine the relationship between athlete gratitude and psychological resilience. Gratitude is considered a relational, reciprocal, and prosocial construct that aligns well with the interdependence inherent in the sports context. This research focuses on both the environmental and individual levels of gratitude, drawing on the multilevel model of gratitude framework. The study investigates how the grateful climate, representing environmental gratitude, influences athletes' psychological resilience through individual gratitude. A longitudinal survey method was employed, involving a total of 289 high school student-athletes from 49 teams who participated in a five-wave survey conducted over a three-year period. The results indicate a significant influence of the grateful climate on changes in athletes' psychological resilience. This influence operates through individual gratitude, which acts as a mediating factor in predicting changes in psychological resilience. The findings of this study can provide practical guidance for human resource managers and educators by highlighting the importance of fostering gratitude at both the individual and environmental levels to enhance athletes' psychological resilience.

Keywords Athletes' Gratitude · Grateful Climate · Multilevel Model of Gratitude · Psychological Resilience

Athletes who participate in sport usually experiencing high level of psychological and physical demands in order to mastery their skills and outperform competitor. Those stressors rooted in their developmental process might harm athlete's well-being (Chen et al., 2022; Rose et al., 2023). For example, Lin et al. (2022) conducted a systematic review and meta-analysis indicated stress–burnout correlation, yielding an overall effect size of 0.505. In their conceptual model for athletic injury, besides, Kalkhoven et al. (2020) also indicated immediate and repetitive stress and strain closely related to athlete various types of injury. Those studies highlight the need to deal with athlete's stress and strain appropriately. In other words, to adapt to stress might not enough, they are urged to bounce back from stressful conditions even beyond the previous level. This phenomenon had been conceptualized as psychological resilience which implied the capacity to recover from adversity had received much attentions both in sport and general area during the past decades (Fletcher & Sarkar, 2013; Galli & Gonzalez, 2015; Mohita Junnarkar et al., 2021).

Fletcher and Sarkar (2012) conducted interviews with Olympic champions, who reported that psychological resilience is a key factor contributing to their athletic performance. Athletes with higher levels of psychological resilience are more likely to rebound from adversity and achieve positive outcomes. As a result, researchers have focused on identifying potential antecedents to foster the development of psychological resilience (e.g., Fletcher & Sarkar, 2012; Galli & Vealey, 2008; Vitali et al., 2015). From a theoretical perspective, previous research has demonstrated that unidirectional support from others can help athletes accumulate social resources to cope with negative emotions and enhance their resilience (Bowlby, 1988).

Different from unidirectional perception of support (Kong et al., 2021; Wiroko & Sugiharti, 2022), we are particularly interested in understanding the impact of bidirectional and reciprocal prosocial behaviors on resilience. In this context, gratitude is a concept of mutual reciprocity that promotes prosocial behavior and is considered a potential factor for exploring athletes' psychological resilience (Emmons & Crumpler, 2000; Ma et al., 2017; McCullough et al., 2001). Therefore, this study aims to examine the impact of gratitude on athletes' resilience.

Drawing from the multilevel model of gratitude proposed by Fehr et al. (2017), we further propose a cross-level framework to understand the antecedents of athletes' psychological resilience. At the team level, a grateful climate indicates that team members collectively exhibit altruistic reciprocity, rooted in cultural values that direct individuals to express gratitude toward their benefactors, even unrelated third parties (McCullough et al., 2001) through an assimilative process. This process facilitates the accumulation of social resources that enable athletes to bounce back from stress (Hobfoll, 1989). In other words, the more grateful a team is, the more grateful and resilient its athletes tend to be.

In summary, our study offers several contributions to the existing literature. Firstly, we adopt a relational perspective when examining athletes' psychological resilience, which focuses on reciprocity. This differs from most previous studies that have primarily emphasized the concept of receiving support unidirectionally (Kong et al., 2021; Wiroko & Sugiharti, 2022). Secondly, the utilization of the multilevel model of gratitude aligns with the growing need to consider both environmental and personal

factors when exploring athletes' psychological resilience (Galli & Gonzalez, 2015). In the following section, we will provide a detailed rationale for our research model.

Psychological Resilience in Sports

First, we will begin by providing an overview of general psychological resilience, and subsequently, we will shift our focus to resilience within the context of sports. Psychological resilience, from a psychological perspective, refers to the capacity to effectively adapt and return to a state of normal functioning after encountering a disturbance or adversity (Scheffer et al., 2018, p. 11,833). Notably, individuals facing significant challenges or disadvantages, such as disadvantaged youths, often display remarkable resilience by developing effective coping mechanisms and responses to such adverse circumstances (Masten, 2014; Zolkoski & Bullock, 2012). This implies that resilient individuals possess the ability to recover and regain their equilibrium more swiftly, even when confronted with threatening situations, in comparison to their less resilient counterparts. These findings are consistent with the research conducted by Fredrickson et al. (2003), who observed that resilient individuals exhibited reduced depressive symptoms by experiencing positive emotions following the September 11th terrorist attacks in the United States. Thus, the ability to bounce back from adversity represents a fundamental aspect of psychological resilience, contributing to an individual's personal growth and overall well-being.

In the realm of sport psychology, researchers widely accept the definition of psychological resilience as the ability to return to a state of normal functioning after encountering disruptions or adversities, considering these disturbances as stressors (Bryan et al., 2019; Sarkar & Fletcher, 2013, 2014). To better understand stress in sports, Galli and Gonzalez (2015) utilize the framework of emergent and minimal-impact psychological resilience (Bonanno & Diminich, 2013). Emergent psychological resilience involves a sustained process of effectively adjusting to ongoing challenges, whereas minimal-impact psychological resilience pertains to a temporary reaction to an intensely distressing incident. For example, student-athletes often navigate an ongoing process of reconciling the conflicting demands of their dual roles as both students and athletes (Tekavc et al., 2015). Moreover, acute traumatic events can occur, such as experiencing a significant loss in a crucial competition or unexpectedly losing a scholarship (Ni et al., 2022; Tekavc et al., 2015).

While previous studies did not explicitly differentiate between the two types of psychological resilience mentioned, this classification provides a solid foundation for understanding psychological resilience in the context of sports. Qualitative studies have shed light on the process by which athletes bounce back from adversity, which involves complex elements such as challenge appraisal and metacognition. Athletes are faced with the task of managing their unpleasant emotions and utilizing coping strategies to overcome obstacles (Fletcher & Sarkar, 2012; Galli & Vealey, 2008). It is important to acknowledge the significant influence of sociocultural factors and personal characteristics throughout this bounce-back process. Taking this perspective into account, we approach psychological resilience from the lens of gratitude, which fosters a supportive climate and facilitates reciprocal interpersonal interac-

tions. In the subsequent section, we draw upon the multilevel model of gratitude proposed by Fehr et al. (2017) to elucidate how gratitude impacts athletes' psychological resilience.

Multilevel Model of Gratitude

Gratitude, viewed through a psychological lens, is characterized as an altruistic quality that sensitizes individuals to the benefits they receive and motivates them to behave pro-socially towards both the benefactor and even unrelated third parties (McCullough et al., 2001). Most gratitude researches have predominantly been studied at the individual level. However, a recent contribution by Fehr et al. (2017) highlights the necessity of adopting a multilevel approach to fully comprehend gratitude. Fehr's multilevel model of gratitude proposes three dimensions: collective gratitude, persistent gratitude, and episodic gratitude. Collective gratitude refers to a shared sense of gratitude that arises through social interaction and exchange at the organizational or environmental level, such as the presence of a grateful climate within a sports team. Persistent gratitude pertains to an individual's enduring tendency to experience gratitude at a lower, individual level, as mentioned earlier. Episodic gratitude, on the other hand, represents gratitude experienced at the event level. Given our interest in the longitudinal development of athletes' psychological resilience, we focused our research on both the environmental and individual levels of gratitude.

At the environmental level, we employed the concept of a "grateful climate," which differs from Fehr et al. (2017)'s notion of collective gratitude. While Fehr et al. suggest that collective gratitude can be assessed by aggregating individual gratitude scores, Chen et al. (in press) argues that a grateful climate is a distinct construct with its own definition and measurement, rather than simply the accumulation of individual gratitude scores (Chen & Hsu, 2022). According to Chen et al. (in press), a grateful climate within a sports team refers to a perception that is environmentally or culturally shaped, wherein team members collectively exhibit values, beliefs, and expected behaviors that align with gratitude. This concept aligns with an old Chinese proverb that states "to knot grass and carry a ring" (銜草結環以報), which emphasizes the importance of reciprocating kindness once the opportunity arises (Chen et al., 2009, p. 656). Consistent with this cultural observation, Hsu et al. (2020) found that athletes seek opportunities to support younger generations once they have achieved success in their own careers. As these beneficiaries become benefactors within a specific social group, this gratitude-driven value creates a self-sustaining upward spiral of positive connections that distinguish the team from others (Fredrickson, 2004). Overall, we anticipated that a team with a grateful climate would exhibit higher levels of adaptive functioning compared to other teams (Fehr et al., 2017).

We propose that a grateful climate has a top-down influence on psychological resilience through an athlete's gratitude. A grateful climate, which stems from values, beliefs, and behaviors, can create a sustained environmental and collective atmosphere that enhances individual-level gratitude. This gratitude is shaped by assimilative pressure and group norms within organizations or teams (Schein, 2010). Specifically, a grateful climate signifies that team members collectively demonstrate altruistic reciprocity rooted in cultural values. Athletes who are consistently

immersed in such a grateful culture or environment are more likely to develop a grateful disposition. Consequently, a grateful climate is expected to be positively associated with an athlete's gratitude.

Moreover, gratitude has the potential to foster social relationships and promote socially facilitative behavior. Gratitude operates through a dynamic upward spiral system that involves long-term expansion, hand-changing, and positive rumination processes (Hsu et al., 2020). Athletes with a grateful disposition may actively seek opportunities to express gratitude not only to their benefactors but also to younger generations or the general public, especially considering the support they received early in their careers. Through these processes, it will help accumulate resources that facilitate coping with stress (Hobfoll, 1989). Consequently, this resource accumulation is expected to contribute to an increase in an athlete's psychological resilience. Based on the aforementioned reasons, we hypothesize a positive relationship between an athlete's gratitude and changes in their psychological resilience.

In summary, drawing on the multilevel model of gratitude, we propose that the grateful climate at the team level influences athletes' psychological resilience through the mediating role of individual-level gratitude. This process of influence operates through a cross-level mediational pathway. By considering the reciprocal nature of gratitude within the athlete-team context, our study offers a fresh perspective on the development of athletes' psychological resilience, highlighting the importance of bi-directional interpersonal interactions at both the individual and environmental levels. This approach expands our understanding of the factors that contribute to the growth of athletes' psychological resilience and provides insights into the complex dynamics between gratitude, team climate, and individual well-being in the sporting context.

Method

Participants and Procedures

Student athletes from high schools were recruited as participants for this study. Permission was obtained from the Institutional Review Board (IRB) to ensure compliance with ethical guidelines. The athletes were invited to voluntarily participate in the study, and surveys were distributed to athletes in each class during their break time. Since the participants were under 18 years old, informed consent was obtained from both their parents and themselves prior to data collection, ensuring their ethical rights. Surveys were administered in classrooms by a research assistant, without the presence of the coach, to maintain confidentiality. Participants returned their completed questionnaires directly to the research assistant.

Data were collected over a period of three years, with six waves of data collection conducted approximately 5 months apart. All data collection occurred outside of the participants' competition seasons. Data from waves 1, 2, 3, 4, and 5 were utilized for analysis. In wave 1, participants were asked to provide demographic information. Domain-general gratitude and psychological resilience measures served as control variables starting from wave 2. In wave 3, participants rated the measure of grateful climate. In wave 4, participants completed the sports-specific gratitude measure.

Finally, in wave 5, participants completed the psychological resilience measure once again (Resilience Measure).

Of the participant, 488 athletes were reached in the first data collection stage, and 442 athletes participated in in the 3-year period. After pooling the data, a total of 289 athletes from 49 teams provided complete data and were included in the analysis. Based on Maas and Hox (2005), it is recommended to have a minimum sample size of 30 at the highest level of analysis (i.e., the team level) to ensure robust estimations in multilevel modeling. The current sample size in team level ($N=49$) thus provides sufficient power to test the study hypotheses. The sample consisted of 95 female athletes and 194 male athletes, with a mean age of 16.24 years ($SD=0.47$). On average, the athletes had 5.23 years of experience in their specialized sport (sport tenure) ($SD=2.51$), and they engaged in an average of 4.24 daily training hours ($SD=1.15$) and 5.56 weekly training days ($SD=0.59$). The respondents represented various sports expertise, including handball, woodball, track and field, korfbal, wrestling, tug of war, martial arts, judo, archery, shooting sport, table tennis, volleyball, baseball, swimming, taekwondo, tennis, kendo, billiards, rugby, fencing, weightlifting, softball, and basketball.

Measurement

Domain-General Gratitude

The 5-item Gratitude Questionnaire Taiwan version (GQ-T; Chen et al., 2009) was used to measure individual's dispositional gratitude. The GQ-6,¹ initially developed by McCullough et al. (2002), and translated into a five-item Taiwan version (Chen et al., 2009), was employed. Previous studies have demonstrated satisfactory reliability and validity of the GQ-T in Chinese athlete and adolescent athlete populations (Chen, 2013; Chen & Chang, 2017; Chen & Kee, 2008). An example item is "I have so much in life to be thankful for." Participants rated the items on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The internal consistency of the scale in the current study was assessed using Cronbach's alpha, which was 0.86.

Domain-Specific Gratitude

The 6-item Gratitude Questionnaire-Sport (GQ-S; Chen & Kee, 2008) was used to assess sports-specific gratitude. The GQ-S was adapted from a general gratitude scale (McCullough et al., 2002) to assess athletes' gratitude specifically in the context of sports. The GQ-S consists of a single factor and has demonstrated satisfactory reliability and incremental validity for the adolescent athlete in previous research (Chen & Chang, 2017). An example item is "I have so much in my entire sport experience or endeavor to be thankful for." Participants rated the items on a 7-point scale ranging

¹ Given the consistent evidence from previous research that suggests poor validity (as indicated by poor model fit and low reliability) of this particular item in the Gratitude Questionnaire (GQ) across different cultures and populations (e.g., Froh et al., 2011; Ling, 2021; Magallares, 2018; Zeng, 2017), it is justified to utilize the five-item version, namely the GQ-T. This approach has been supported by prior studies and provides a more appropriate measure of gratitude.

from 1 (*strongly disagree*) to 7 (*strongly agree*). The internal consistency of the scale in the current study was assessed using Cronbach's alpha, which was 0.81.

Grateful Climate

The 9-item Sports Team Grateful Climate Questionnaire (Chen et al., in press) assessed the grateful climate within sports teams, demonstrating satisfactory reliability and validity of this scale in Chinese adolescent athletes. The questionnaire measures the perception of a culturally shaped environment within the team, wherein members collectively exhibit values, beliefs, and expected behaviors that align with gratitude. It does not aggregate individual trait gratitude scores, but rather focuses on the team-level variable of grateful climate. Sample items include "People on our team think that being grateful and expressing gratitude is important" and "On this team, people always express gratitude for the contributions of others." To examine the aggregation of grateful climate, the average inter-member agreement ($r_{wg(j)}$) across teams was 0.70. Furthermore, the intra-class correlation for grateful climate was $ICC(1)=0.13$, $F=1.62$, $p<.05$, and $ICC(2)=0.47$ in the current study. These results satisfy the criteria for within-team agreement (LeBreton & Senter, 2007) and inter-member reliability (Bliese, 2000), providing support for aggregating grateful climate scores to the team level. Participants rated each item on a scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). The internal consistency of the scale in the current study was assessed using Cronbach's alpha, which was 0.95.

Psychological Resilience

The 6-item brief psychological resilience scale (Smith et al., 2008) as utilized to measure athletes' psychological resilience. The BRS was specifically designed to assess an individual's ability to recover and bounce back from adversity. Previous studies with Chinese athlete populations have provided evidence for the scale's reliability and validity (e.g., Chung et al., 2013). In addition, the validity and reliability of this scale for adolescents are supported by prior research (Bluth et al., 2018, 2023). An example item from the BRS is "I tend to bounce back quickly after hard times." Participants responded to each item using a scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). The internal consistency of the scale was assessed using Cronbach's alpha, which yielded values of 0.82 at Wave 2 and 0.74 at Wave 5 in the current study.

Control Variables

We included several control variables to account for their potential effects on psychological resilience, namely athletes' gender, age, sport tenure, and training loads ((i.e., daily training hours and weekly training days; Bonanno et al., 2007; Den Hartigh et al., in press). Gender was dummy-coded, with male athletes coded as "1" and female athletes coded as "2." Age and sport tenure were self-reported in years. Training loads, including daily training hours and weekly training days, were self-reported in hours and days, respectively. To examine the change in psychological resilience over time, we employed a residual change approach, which involved including the prior

level of athletes' psychological resilience as a covariate (Little et al., 2006). Furthermore, to enhance the incremental validity of the grateful climate and sports-specific gratitude measures, we included domain-general gratitude as an additional control variable to account for shared variance.

Results

Attrition Analysis and Descriptive Statistics

To assess whether nonresponses in the obtained data were systematic, dummy variables were created to categorize respondents into different groups based on their nonresponses across various waves. Demographic variables were then compared between respondents and non-respondents (Ployhart & Vandenberg, 2010). The results indicated that the groups did not have differences in terms of gender ($\chi^2 = 14.38, p > .05$), age ($F_{(12, 429)} = 0.83, p > .05$), sport tenure ($F_{(10, 420)} = 1.05, p > .05$), daily training hour ($F_{(12, 428)} = 1.74, p > .05$), and weekly training days ($F_{(12, 429)} = 0.94, p > .05$). These findings suggested that the nonresponses in obtained data were not systematic.

Table 1 presents the means, standard deviations, and correlations of research variables. The correlations among our focal variables were as expected. Psychological resilience at Wave 2 was positively related to psychological resilience at Wave 5 ($r = .46, p < .01$). Grateful climate at Wave 3 was positively related to sports-specific gratitude at Wave 4 ($r = .23, p < .01$). Sports-specific gratitude at Wave 4 was positively related to psychological resilience at Wave 5 ($r = .18, p < .01$).

HLM Null Models and Hypotheses Testing

Due to the multilevel nature of the theoretical hypotheses and empirical data, we initially conducted null models with no predictors and calculated the ICC(1) for psychological resilience at Wave 5 before hypothesis testing. The analysis revealed an ICC(1) of 0.06, indicating a non-independent data structure (Dyer et al., 2005), thus supporting the use of hierarchical linear modeling. Consequently, a two-level random intercept model was employed to examine our hypotheses (Bryk & Raudenbush, 1992). Specifically, we utilized multilevel modeling with maximum likelihood estimation in SPSS (Heck et al., 2014) to test our research hypotheses. Level-1 predictors (gender, age, sports tenure, daily training hour, weekly training days, domain-general gratitude, and psychological resilience at Wave 2) were group-mean centered, and the Level-2 predictor (grateful climate) was grand-mean centered (Hofmann & Gavin, 1998). To assess the mediation effect, we employed a nested-equation path analytic approach (Edwards & Lambert, 2007; Preacher et al., 2007) and estimated the indirect effects and confidence intervals using a Monte Carlo method (Bauer et al., 2006; Preacher & Selig, 2012; Selig & Preacher, 2008).

To test the hypotheses, a series of regression models were conducted (see Table 2). Model 1 included gender, age, sport tenure, daily training hour, weekly training days, domain-general gratitude, and psychological resilience at Wave 2 as predictors of sports-specific gratitude at Wave 4. The results showed that domain-general gratitude

Table 1 Means, standard deviations, and correlations

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10
1. Gender (male=1, female=2)	--	--	--									
2. Age	16.24	0.47	-0.09									
3. Sport tenure (year)	5.23	2.51	0.23**	0.07								
4. Daily training hours	4.24	1.15	0.14*	0.00	0.19**							
5. Weekly training days	5.56	0.59	0.06	-0.02	0.12*	0.13*						
6. Domain-general gratitude (Wave 2)	5.94	1.00	0.09	0.10	0.08	0.06	0.02					
7. Psychological resilience (Wave 2)	3.62	0.92	-0.25**	0.10	-0.01	-0.01	-0.11	0.16**				
8. Individual grateful climate (Wave 3)	4.70	1.00	-0.11	0.05	0.00	0.02	0.12*	0.32**	0.06			
9. Grateful climate (Wave 3)	4.70	0.52	-0.17**	0.03	-0.01	-0.04	0.06	0.24**	0.03	0.52**		
10. Sports-specific gratitude (Wave 4)	5.54	1.01	0.12*	0.08	0.10	-0.01	0.05	0.48**	0.06	0.38**	0.23**	
11. Psychological resilience (Wave 5)	3.67	0.83	-0.25**	0.06	-0.09	-0.03	-0.12*	0.14*	0.46**	0.12*	0.06	0.18**

* $p < .05$. ** $p < .01$

Note: Team N = 49; athlete N = 289. Team-level variable was grateful climate was assigned to members of the same team to calculate the individual-level correlations

at Wave 2 significantly and positively predicted sports-specific gratitude at Wave 4 ($b=0.42, p<.01$).

Model 2 added grateful climate at Wave 3 as an additional predictor of sports-specific gratitude at Wave 4. After controlling for demographic variables, domain-general gratitude, and psychological resilience at Wave 2, the results revealed that grateful climate at Wave 3 positively predicted sports-specific gratitude at Wave 4 ($b=0.45, p<.01$).

Model 3 was conducted to examine the predictors of psychological resilience at Wave 5, including gender, age, sport tenure, daily training hour, weekly training days, domain-general gratitude, and psychological resilience at Wave 2. The results showed that psychological resilience at Wave 5 was positively predicted by domain-general gratitude at Wave 2 ($b=0.09, p<.05$) and psychological resilience at Wave 2 ($b=0.36, p<.01$).

In Model 4, grateful climate at Wave 3 was added as an additional predictor of psychological resilience at Wave 5. However, the results revealed no significant effect of grateful climate at Wave 3 on psychological resilience at Wave 5 ($b=0.08, ns$).

Finally, Model 5 included sports-specific gratitude at Wave 4 as an additional predictor of psychological resilience at Wave 5. After controlling for all the predictive variables in Model 4, the results indicated that sports-specific gratitude at Wave 4 significantly and positively predicted psychological resilience at Wave 5 ($b=0.13, p<.01$).

To examine the mediation effect, a nested-equation path analytic approach was employed. Coefficients obtained from Model 2 and Model 5 were used to calculate Monte Carlo confidence intervals for testing the indirect effects, utilizing the R Mediation program. Consistent with our hypothesis, the indirect effect of grateful climate at Wave 3 on psychological resilience at Wave 5 through sports-specific gratitude at Wave 4 was found to be significant and positive (indirect effect=0.06, 95% C.I. = 0.016 to 0.112). This indicates that sports-specific gratitude at Wave 4 mediated the relationship between grateful climate at Wave 3 and psychological resilience at Wave 5.

Discussion

Based on the multilevel model of gratitude, the current study investigated the effect of gratitude at the team and individual levels on athletes' psychological resilience over time. Through the analysis of multi-wave longitudinal data, the results demonstrated that a grateful climate significantly influenced changes in athletes' psychological resilience through their own gratitude, aligning with the research hypotheses. Subsequent sections offer a comprehensive discussion based on the research hypotheses and findings, further detailing how these insights augment the existing body of knowledge, implications and limitations.

Firstly, a salient outcome and contribution of this study is the assertion that gratitude, characterized as a bidirectional interactive and altruistic relational asset, can bolster psychological resilience. Existing literature on social support has often concentrated on individual perceptions or the actual acquisition of resources, depicting a concept of one-sided reception. In contrast to prior research that primarily examined

Table 2 Results of fixed effect in a two-level random intercept model for athlete's psychological resilience

	Sports-specific gratitude (Wave 4)		Psychological resilience (Wave 5)		
	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	5.55**	5.55**	3.67**	3.68**	2.95**
Gender	0.08	0.08	-0.38**	-0.38**	-0.39**
Age	0.09	0.09	-0.02	-0.02	-0.04
Sport tenure	-0.00	-0.00	-0.02	-0.02	-0.01
Daily training hours	-0.06	-0.06	0.01	0.01	0.02
Weekly training days	0.15	0.15	-0.16	-0.16	-0.18
Domain-general gratitude (Wave 2)	0.42**	0.42**	0.09*	0.09*	0.04
Psychological resilience (Wave 2)	-0.03	-0.03	0.36**	0.36**	0.36**
Grateful climate (Wave 3)		0.45**		0.08	0.02
Sports-specific gratitude (Wave 4)					0.13**
-2 Loglikelihood	766.43	753.62	633.36	632.85	625.15
Residual	0.75**	0.75**	0.47**	0.47**	0.46**
Intercept F	0.11*	0.06	0.07*	0.07*	0.07*

* $p < .05$; ** $p < .01$

Note: Unstandardized coefficients are reported

the association between unidirectional perceived social support and psychological resilience (e.g., Chang & Yarnal, 2017; Fletcher & Sarkar, 2012; Smith et al., 2008; Zhang et al., 2023), this study adopts the relational approach to gratitude (Bono & Sender, 2018; Ma et al., 2017; Tsang et al., 2022).

Specifically, this study adopts a bidirectional and altruistic perspective to view athletes' gratitude, evaluating its impact on their psychological resilience. The results indicate that athletes' sport gratitude is positively correlated with changes in their resilience, consistent with the research hypotheses as Model 5 exams that sport-specific gratitude at Wave 4 ($b=0.13$, $p < .01$) and psychological resilience at Wave 2 ($b=0.36$, $p < .01$) significantly and positively predicted psychological resilience at Wave 5 (see Table 2). These insights reveal the unique influence of gratitude's reciprocal nature, involving a network exchange of resources, on psychological resilience—differing from the unidirectional perceived social support described in prior research.

Secondly, another contribution of this study is the validation of a multilevel model of gratitude (Fehr et al., 2017). This research demonstrated that gratitude can be conceptualized at higher levels and examines how grateful climate influences psychological resilience through individual gratitude traits. Fehr et al. (2017)'s multilevel model of gratitude has proposed the construct at individual and team levels, with limited exploration of their interrelationship. Simultaneous empirical research into how gratitude operates across these two levels to impact psychological resilience has been notably lacking. Building on this foundation, the present study delineates grateful climate and individual gratitude trait assess their predictive effects on athletes' psychological resilience. The impact of gratitude is theorized to extend gratitude at the individual level and team level are interrelated. This is attributed to gratitude, which includes the processes of giving and receiving benefits, fosters a tightly interconnected social network. Within this network, interpersonal resources are continu-

ally accumulated (Bartlett et al., 2012; Chang et al., 2012; Nowak & Roch, 2007; Yoshida, 2022).

Specially, in sports contexts, influenced by social norms or internalized pressures (Schein, 2010), athletes may become adept at resource exchange. A pronounced grateful climate is hypothesized to foster the development of individual trait gratitude. The results support this hypothesis, as Model 2 testing indicates that grateful climate at Wave 3 positively predicts athletes' sport-specific gratitude trait at Wave 4 ($b=0.45$, $p<.01$), suggesting that grateful climate is a predictor of athletes' sport gratitude trait.

Furthermore, the study posits a mediation model wherein a grateful climate and individual gratitude traits contribute to psychological resilience. Teams with a culture of gratitude are believed to possess a greater abundance of interpersonal resources, which in turn may enhance athletes' psychological resilience by providing wider access to stress management resources. The results corroborate this mediation model, indicating a significant and positive indirect effect of grateful climate at Wave 3 on psychological resilience at Wave 5 through sport-specific gratitude at Wave 4 (indirect effect=0.06, 95% CI=0.016 to 0.112). The results are not only consistent with the hypotheses but also robust across multi-wave data analyses, even accounting for control variables and time intervals. This study is the first to empirically demonstrate the multilevel model of gratitude, suggesting that gratitude can be conceptualized at higher levels and that it impacts athletes' psychological resilience through their gratitude traits.

As previously mentioned, the authors made another significant contribution for the gratitude literature by empirically demonstrated the multilevel model of gratitude. We provided empirical evidence to support the notion that gratitude can be conceptualized at a higher level and exert its effects on athletes' psychological resilience through their own gratitude. As Fredrickson (2004) initially stated gratitude, like other positive emotion, broadens and builds thereby transforming organizations and communities. Subsequently, Froh et al. (2011) proposed a theoretical multilevel model of gratitude in organization to examine the inputs, process, and outcomes of gratitude across levels. While there are differences in how gratitude in organization is measured, we found evidence to support that each sports team differ from others (i.e., $ICC(1)=0.13$ and $ICC(2)=0.47$ for grateful climate in the current study). Moreover, athlete's gratitude mediated the cross-level relationship between grateful climate and change in athlete's psychological resilience. Our findings partially correspond to the study conducted by Li et al. (2023), in which they demonstrated high school student's gratitude mediates the relationship between perceived school climate and prosocial behavior. This top-down mediating effect in our study was quite robust as we collected multiple waves of data and controlling for the previous score of athlete's psychological resilience, alleviating the common method variance (Spector & Brannick, 2010). Furthermore, our model also included domain-general gratitude. In this regard, the shared variance in domain-general and sports-specific gratitude was

account for (Chen et al., 2023), offering incremental predictability and explaining the unique variance in change of an athlete's psychological resilience.²

Since athlete's psychological resilience is a critical mental indicator for athlete, current study has important practical implication. As Fehr et al. (2017) consider grateful climate in organizations can be cultivated by strategic human resources practices which is sending clear signals and facilitating interaction. Sending clear signals mean the human resources department implements appreciation programs, maintains regular contact with beneficiaries, enforces developmental feedback policies, and incorporates relevant practice while facilitating interaction indicated employees engage in information sharing to collectively achieve the desired outcome. As sports team is interdependent in nature, the two strategies are applicable for sports teams. For example, the manager can strive to increase the interaction between sports team and sponsors or fans, thereby enhancing the athletes' sense of support and assistance. This can also encourage the team to explore more feedback solutions, creating a positive cycle. In addition, during the training or competition process, team members can collectively set goals and share strategies and methods to achieve them. Through deep self-disclosure processes, the team becomes even more tightly knit as a cohesive unit. Therefore, we expect grateful climate can be cultivated through those strategies.

A number of limitations to our study should be noted. First, although we adopted a longitudinal approach by tracking athletes over seven months, all the measures were self-reported. Therefore, the presence of common method bias cannot be ruled out (Spector & Brannick, 2010). Future studies could consider collecting ratings from multiple sources to provide additional validation of our results. This approach would also allow for interesting discussions if discrepancies were found among different rating sources. Second, when choosing our time intervals for data collection, we accommodated athletes' schedules by selecting times that did not conflict with their competitions. While this approach was suitable for the purposes of data collection, it is possible that grateful climate might be different during a period featuring such competitions (Stenling et al., 2017). In the future, thus, it would be valuable to examine whether the grateful climate varies with different seasons of the sports season. Third, while we included a set of control variables, such as sport tenure and training hours, to mitigate alternative explanations, it is possible that we overlooked other significant variables that could influence athletes' psychological resilience, such as their motivation or personality (Galli & Gonzalez, 2015; Sarkar & Fletcher, 2014). Future studies would benefit from considering a broader range of such factors.

In conclusion, our study based on the multi-level gratitude model revealed that a grateful climate enhances athletes' psychological resilience by fostering their gratitude. This significant finding illuminates another pathway to strengthen athletes' psychological resilience, thereby making a valuable contribution to promoting their mental well-being. Furthermore, our study contributes to the gratitude literature by

² The data for this study were collected as part of a larger project, which involved six waves of data collection over a three-year period. The project was supervised and funded by the first authors. It is important to note that the Gratitude Questionnaire (GQ; wave 2) and Gratitude Questionnaire-Sport (GQ-S; wave 4) used in this study have also been reported in another independent article, which aims to capture the growth of athlete's gratitude. However, it is worth mentioning that neither the analysis nor the findings presented in this study have been reported in any prior work.

confirming the effects of a climate of gratitude, adding a new layer of contribution to the field.

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Data Availability The data for this study were collected in the context of a larger project (a six-waves of data collection across three years) supervised and funded by the first authors. Current study used the first, second, third, fourth, and fifth wave of variables from the project. We declare that the Gratitude Questionnaire-Sport in this study also reported in another independent article under review aim at capturing the growth of athlete's gratitude. Apart from this, neither the analysis nor the findings had been reported in prior work.

Declarations

Ethics approval and consent to participate This study was approved by the National Taiwan University review board (202012ES010)

Informed consent The athletes were instructed to read the information sheet, and signed an informed consent form before the survey. Therefore, their confidentiality and anonymity were ensured.

Competing interests The authors declare that they have no conflict of interest.

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