Measuring Grateful Climate at the Sports Team

Lung Hung Chen (ORCID: 000-0001-5217-1117)
Doctoral Program for Transnational Sport Management and Innovation, National Taiwan Sport University, Taoyuan City, Taiwan; Department of Medical Research, China Medical University Hospital, China Medical University, Taichung, Taiwan, fjudragon@ntsu.edu.tw

Che-Chun Kuo
Department of Physical Education, Tunghai University, Taichung City, Taiwan
chechunk@gmail.com

Ying-Lien Ni
Department of Physical Education, Health & Recreation,
National Chiayi University, Chiayi City, Taiwan, colabear0413@gmail.com

Chia-Huei Wu (ORCID: 0000-0002-8011-6323)
King's Business School, King's College London, London, UK; Department of Medical Research, China Medical University Hospital, China Medical University, Taichung, Taiwan
chiahuei.wu@gmail.com

Shih-Chi Hsu (ORCID: 0000-0002-3939-3775)
Department of Crime Prevention and Corrections, Central Police University, Taoyuan City, Taiwan, freekiki2002@gmail.com

- Conflict of interest statement: The authors declare that they have no conflict of interest.
- Compliance of ethical standard statement: 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.
- 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 second wave of variables form 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.

Acknowledgement
Lung Hung Chen was supported by the Ministry of Science and Technology (MOST 110-2628-H-179-001 & MOST 111-2628-H-179-001), Taiwan.

Corresponding author: Lung Hung Chen
Doctoral Program for Transnational Sport Management and Innovation, National Taiwan Sport University,
No. 250, Wen Hua 1st Road, Guishan, Taoyuan City, Taiwan
Tel: 886-937148789
Email: fjudragon@ntsu.edu.tw

This is the Author's Accepted Manuscript version of the article: Chen, L. H., Kuo, C. C., Ni, Y. L., Wu, C. H. & Hsu, S-C. (in press). Measuring grateful climate at the sports team. Journal of Positive Psychology. Accepted for publication on 25 Aug 2023.

Abstract

Developing a measurement of grateful climate is an essential step to examining the function of a grateful climate in a team or group context. Accordingly, the purpose of this study was to develop a valid and reliable measure of the grateful climate of sports teams. We defined the grateful climate of sports teams as a culturally shaped perception that team members collectively exhibit values, beliefs and expected behaviors that fit with the script of gratitude. Exploratory factor analysis and multilevel confirmatory factor analysis were conducted to evaluate the validity and reliability of the Sports Team Grateful Climate Questionnaire. In addition, nomological validity and incremental validity were also examined. The results indicated that the 9-item Sports Team Grateful Climate Questionnaire has good convergent validity, nomological validity, and incremental validity. We concluded that it can be a useful tool for future studies aiming to better understand grateful climate in sports teams.

Keywords: gratitude, sports team, scale development, multilevel analysis

Measuring Grateful Climate at the Sports Team

Studies to date have consistently demonstrated the positive effects of gratitude on individuals' thoughts and actions (Fredrickson, 2004; McCullough et al., 2001; Wood et al., 2010). As a result, gratitude has been conceptualized and measured, with scholars offering different perspectives on its nature. For instance, McCullough et al. (2002) define gratitude as an affective trait that encompasses individuals' general tendency to recognize and respond with grateful emotion to the benevolent actions of others, resulting in positive experiences and outcomes (p. 112). Additionally, McCullough et al. (2004) define gratitude as an emotion that is consistently experienced when individuals perceive themselves as recipients of intentionally bestowed valuable benefits that come at a cost to the benefactor (p. 296). These definitions predominantly focus on the conventional approach of studying gratitude at the individual level.

However, gratitude can also be conceptualized at a collective level beyond individuals. Fehr et al. (2017) propose a conceptual multilevel model of gratitude that extends the concept to teams or groups, encouraging researchers to explore the role of gratitude in such contexts. In group settings, a consensus emerges from members or social norms, shaping individuals' cultural values and behaviors (Chen & Hsu, 2022). This broader conceptualization of gratitude highlights the potential influence of collective dynamics and cultural factors on the experience and expression of gratitude.

To the best of our knowledge, no existing measurement tool captures gratitude at the group level beyond the individual level, which is a crucial step in empirically examining the function of a grateful atmosphere within team or group contexts. Without defining and measuring gratitude at the group level, we would be unable to address important questions. For instance, what are the factors that contribute to a higher level of gratitude within a group, and what are the

consequences associated with such a higher level? How do teams characterized by a strong sense of gratitude differ in their thoughts and actions compared to teams with lower levels of gratitude? Under what conditions does a higher level of gratitude enhance or diminish members' cognitive processes, emotions, and behaviors at the individual level? Clearly, in order to answer these questions, it is crucial to have a well-defined and reliable measure of gratitude at the group level.

To address this research gap, the objective of the present study was to develop a valid and reliable measure of the grateful atmosphere within sports teams. We propose that this construct should be labeled as "gratitude climate," which refers to the group-level atmosphere, as suggested by Luria (2019) . It is important to note that the concept of grateful climate at the team or group level cannot be adequately assessed by simply utilizing existing measures of gratitude at the individual level, as outlined in Chan (1998) r referent-shift model. Gratitude climate represents a distinct construct that cannot be aggregated from individual-level gratitude measures specific to the sports domain.

In the context of sports teams, the proverbial saying, "There is no '*I*' in the team," highlights the collective nature of teamwork, making it an ideal setting to develop an initial tool for measuring gratitude at a higher level. Within a team, athletes work and often live together, facilitating the sharing of values, thoughts, and behaviors through interpersonal interactions. Moreover, cultural values provide a framework that guides athletes to conform to certain cultural norms (Chen & Hsu, 2022; Fehr et al., 2017). Consequently, gratitude becomes a characteristic that extends beyond individual team members and becomes inherent to the team itself. Thus, in this study, we define the grateful climate of sports teams as the shared perception among team members regarding their values, beliefs, and expected behaviors related to gratitude.

In the subsequent sections, we will review existing gratitude theory and present a rationale for the conceptualization of grateful climates within sports teams. The development and validation of items will be outlined, encompassing various phases of the research process. Specifically, we will carefully examine Fehr et al. (2017) multilevel model of gratitude and make slight modifications based on Luria (2019) concept of "climate" and Chan's (1998) referent-shift model. Additionally, we will provide a comprehensive description of the manifestation of gratitude climate in the sports domain, drawing on insights from prior empirical studies (Hsu et al., 2020). Through this study, we aim to make a valuable contribution to the existing gratitude literature by introducing a measurement tool and investigating relevant concepts pertaining to grateful climates within sports teams.

Gratitude at the Individual Level

Gratitude has been conceptualized as an emotion, mood, or affective trait in the literature (McCullough et al., 2002). As an emotion, gratitude can arise from specific events, such as unexpectedly receiving help from a stranger in times of need. It is important to note that gratitude encompasses more than just a positive emotion; it also elicits prosocial motivation, leading individuals to engage in helpful and benevolent behaviors (Bartlett & DeSteno, 2006; Tsang & Martin, 2019). Gratitude can also be experienced as a mood that can vary throughout the day or across different days (Rosenberg, 1998, p. 250). Grateful moods tend to have a sustained duration and a gentle intensity. However, the aspect of gratitude that has received the most attention in the literature is its affective trait form. Affective trait gratitude refers to an individual's inherent tendency to recognize and respond with grateful emotions to the benevolent actions and contributions of others, leading to positive experiences and outcomes (McCullough et al., 2002, p. 112).

Gratitude has been conceptualized in various ways, and extensive research has consistently demonstrated its adaptive effects on individuals. Grateful individuals exhibit positive tendencies and behaviors, such as positive reinterpretation of events (Lambert et al., 2011; Wood et al., 2007). They tend to view hardships as challenges rather than threats, enabling them to effectively cope with stress (Hsu et al., 2020). Gratitude also promotes the alignment between coping strategies and specific circumstances, providing protection against stress (Sun et al., 2020). Furthermore, daily experiences of gratitude, as reported by Nezlek et al. (2019), were found to be positively associated with well-being indicators at the individual level. Additionally, daily gratitude experiences served as a buffer, mitigating the impact of stressful events on well-being indicators. Since the influential publication by McCullough et al.'s (2002), research on gratitude has expanded and diversified, exploring various dimensions and types of gratitude.

These definitions primarily focus on studying gratitude at the individual level, but it is worth noting that gratitude can also be conceptualized at a level beyond individuals. In a recent work, Fehr et al. (2017) put forth a conceptual multilevel model of gratitude, expanding the scope of gratitude to include the team or group level. They encouraged researchers to investigate the role of gratitude in these collective contexts, highlighting the importance of studying gratitude beyond the individual level.

Gratitude at Group Level

The multilevel model of gratitude proposed by Fehr et al. (2017) offers a new perspective to broaden the scope of gratitude beyond previous studies that primarily focused on intrapersonal gratitude at the trait level. Their model introduces a bottom-up process that encompasses different levels of gratitude. According to Fehr et al. (2017), this multilevel model includes (1) episodic gratitude as an emotion at the event level, (2) persistent gratitude as an individual-level

tendency, and (3) collective gratitude at the organizational level (p. 362). The concept of collective gratitude, as defined by Fehr et al. (2017), refers to the enduring experience of gratitude that is shared among members of an organization (p. 346). They propose that collective gratitude at the organizational level emerges from individual-level persistent gratitude through social interaction and exchange. Fehr et al. (2017) also highlight that their multilevel model of gratitude, which focuses on consensus among individual members' perspectives and experiences, aligns with Chan's (1998) "direct consensus model."

In this model, aggregating individual-level data to a higher level of analysis involves examining within-group agreement of scores to indicate consensus at the lower level and justify the aggregation of lower-level scores to represent scores at the higher level. Therefore, Fehr et al.'s (2017) multilevel model of gratitude is considered a bottom-up process model as it adopts the direct consensus model (Chan, 1998), whereby collective gratitude at the organizational level emerges from individual-level persistent gratitude.

Conceptualization of a Grateful Climate

We acknowledge and adopt the multilevel model of gratitude presented by Fehr et al. (2017), which expands the concept of gratitude from the individual level to the organizational (team) level. However, we deviate from Fehr et al. (2017) in terms of the conceptualization of collective gratitude at the group level. While Fehr et al. (2017) propose that collective gratitude is not a distinct construct independent of individual gratitude but rather the aggregation of persistent gratitude scores at the individual level, in our research, we refer to the group-level gratitude as "gratitude climate" based on Luria's (2019) framework. We assert that gratitude climate is a unique construct that should not be aggregated with intrapersonal gratitude at the individual level.

"Climate perception" at the group level, as proposed by Luria (2019), is formed through a dynamic process consisting of three stages (Luria, 2019, p. 1059): (a) exposure to events, where members of the same group share similar experiences that contribute to the emergence of the climate; (b) interpretation of events, where group members engage in a collective sense-making process that leads to shared opinions based on their experiences; and (c) preservation of behaviors and perceptions, where groups develop mechanisms to maintain uniformity and similarity once the group climate is established. These three stages form a cyclical process that enhances and sustains a shared climate at the group level.

It can be inferred that during the exposure and interpretation stages, the "environment" in which group members are repeatedly exposed to events plays a significant role in reinforcing the existing climate. Therefore, the social or cultural norms within the environment in which participants live, including the dominant culture of communication and self-construal, deserve special attention. Additionally, cultural values serve as a guiding framework that directs athletes to adhere to a set of cultural norms (Chen & Hsu, 2022; Fehr et al., 2017). Based on the aforementioned review, we define the grateful climate of sports teams as a culturally shaped perception in which team members collectively exhibit values, beliefs, and expected behaviors that align with gratitude.

Referent-shift Consensus Model of Grateful Climate

In our study, we propose that gratitude climate is a unique construct that cannot be aggregated with intrapersonal gratitude at the individual level, as suggested by Fehr et al. (2017). Instead, we adopt the concept of "climate" proposed by Luria (2019), which emphasizes the aggregation of individuals as a group and recognizes the interdependence among group members in the emergence and shared perception of climate. The process of perceiving the environment

within a group is social and interconnected, constituting a group-level climate. This approach aligns with the "referent-shift consensus model," which differs from the "direct consensus model" employed in Fehr et al.'s (2017) multilevel model of gratitude.

The referent-shift model, similar to the direct consensus model, involves composing lower-level individual attributes into a higher-level group construct. However, in the referent-shift model, there is a conceptual shift in the referent, whereby the individual-level construct is defined and operationalized in terms of "we," "our group," or "members of our team" instead of the individual "I" used in the direct consensus model (Chan, 1998, p. 238). This shift in referent reflects a change in the conceptual definition and measurement of the individual level, considering the higher-level structure. For example, while the direct consensus model aggregates survey items that capture individual perceptions (e.g., "I think..."), the referent-shift consensus model aggregates items that reflect an individual's perception of some higher-level entity (e.g., "People on our team think...").

To provide further support for adopting the referent-shift consensus model in our study, we integrate it with the dynamic model of group-level climate emergence labeled the "exposure, interpretation, preservation model of group-level climate emergence" proposed by Luria (2019). This combination enhances the persuasiveness and explanatory power of our approach.

Items of a Grateful Climate

According to the explanation mentioned above, the grateful climate is conceptualized as an independent construct and not merely an aggregation of individual gratitude among group members. Therefore, one of the main objectives of this study is to develop a scale to measure the grateful climate. The development of the Grateful Climate Scale is based on three key perspectives. First, in line with the Referent-shift Consensus Model (Chan, 1998), the current

study adopts a group and consensus level approach by using terms such as "we," "everyone," and "people on our team" instead of individual-level pronouns ("I") when formulating the scale items. Specifically, participants are asked to indicate their level of agreement with the perceived expression of gratitude by team members (e.g., people or everyone on this team) rather than reporting their personal experience of gratitude.

Second, as we define grateful climate in sports teams as a culturally shaped perception characterized by collective values, beliefs, and expected behaviors aligned with gratitude, we take into account the surrounding cultural context in which athletes reside. To explore the cultural values, beliefs, and behaviors associated with gratitude, we examine the meanings and implications of gratitude found in slang or idioms that reflect cultural values. For instance, expressions such as "never forget where one's happiness comes from," "pay the debt of gratitude," "know for sure would return one's favor," and "remember owing a debt of gratitude and be grateful until death" demonstrate the enduring nature of cultural values, beliefs, and behaviors related to expressing gratitude towards benefactors. These rich denotations and connotations of gratitude found in slang or idiomatic expressions should be considered when formulating items for the Grateful Climate at Sports Team scale. Additionally, empirical studies conducted in the sports domain have also highlighted the values, beliefs, and behaviors associated with expressing gratitude towards benefactors or givers, emphasizing the notion of ongoing reciprocity (Hsu et al., 2020).

Finally, the development of the Sports Team Grateful Climate Questionnaire takes into consideration the specific characteristics of athletes and their expressions of gratitude in the sports context. Building upon the work of Hsu et al. (2020), several key characteristics of gratitude in athletes inform the design of the questionnaire. Firstly, athletes' gratitude is

characterized by its enduring nature, as they strive to repay their benefactors regardless of the passage of time. Secondly, athletes express gratitude towards various targets and content, including gratitude for the provision of training resources, the foundational contributions of predecessors, and others who have supported them, without necessarily singling out specific individuals. Additionally, the boundless nature of gratitude is reflected in athletes' inclination to extend their gratitude not only to their benefactors but also to the general public. Moreover, athletes seize opportunities to express gratitude, even if it means repaying their benefactors or passing on the kindness to others many years later. The Sports Team Grateful Climate Questionnaire aims to measure the grateful climate within sports teams by drawing upon relevant gratitude theories, such as the referent-shift consensus model (Chan, 1998), cultural beliefs, and insights from previous empirical studies conducted in the sports field.

Study Overview

To establish the construct validity of the Sports Team Grateful Climate Questionnaire, a series of five steps were undertaken. Firstly, the authors developed the initial set of items to provide an operational definition of the grateful climate construct. To ensure content validity, a panel of experts assessed the alignment between the conceptual and operational definitions of the construct. Secondly, an exploratory factor analysis was performed to evaluate the quality of the items and to identify the underlying factor structure of the grateful climate within sports teams. Thirdly, a multilevel confirmatory factor analysis was conducted to confirm the factor validity of the Sports Team Grateful Climate Questionnaire.

Fourth, to establish the nomological validity of the Sports Team Grateful Climate Questionnaire, three constructs at the team level were examined. Firstly, coaches' autonomy support was assessed, which refers to the support provided by coaches to empower team

members in setting their goals and activities, and is recognized as a significant motivational factor in sport teams (Fenton et al., 2014). This construct was chosen to demonstrate that a grateful climate is distinct from coaches' behaviors. However, it was expected that teams receiving greater autonomy support from coaches would develop a stronger grateful climate, as coach autonomy support is an influential contextual factor that impacts all team members and fosters a sense of gratitude among them. Besides, the subjective vitality of teams, which represents the overall level of subjective vitality experienced by team members, was examined. This concept was selected to demonstrate that a grateful climate is conceptually distinct from vitality but can contribute to the overall vitality of teams. Teams with a more grateful climate are likely to experience positive emotions, which can enhance team energy through the broaden and build process proposed by Fredrickson (2003). Lastly, sports-specific gratitude at the team level was included to demonstrate that the composition of team members in terms of their trait gratitude can facilitate the development of a more grateful climate. When team members possess higher levels of sports-specific gratitude, the team is more likely to exhibit behaviors and communication that express gratitude during their interactions, thereby contributing to the cultivation of a grateful climate. It should be noted that sports-specific gratitude is distinct from the grateful climate construct, as the former pertains to the individual trait of gratitude among team members, while the latter encompasses gratitude-related beliefs, values, and behaviors expressed through the interactions among team members.

Fifth, to further establish the unique contribution of a grateful climate, we conducted additional analyses to examine whether the expected positive associations between grateful climate and coaches' autonomy support, as well as subjective vitality, remain significant even after controlling for sports-specific gratitude. By controlling for sports-specific gratitude, we

aimed to assess whether the positive associations between grateful climate and these two constructs hold true independently of the individual trait of gratitude among team members.

If the positive association between grateful climate and coaches' autonomy support remains significant after accounting for sports-specific gratitude, it indicates that a grateful climate can be fostered through situational factors, such as the support provided by coaches, and is not solely reliant on the individual trait of sports-specific gratitude among team members. Similarly, if the positive association between grateful climate and subjective vitality remains significant after controlling for sports-specific gratitude, it suggests that the development of vitality within teams can be influenced by grateful interactions among team members, beyond the effects of their individual levels of sports-specific gratitude.

Through these five steps, we aimed to provide preliminary evidence supporting the construct validity of the Sports Team Grateful Climate Questionnaire by examining its associations with coaches' autonomy support, subjective vitality, and sports-specific gratitude at the team level.

Method

Phase One

Item Development and Content Validity

The authors developed an item stem for the Sports Team Grateful Climate Questionnaire based on their definition of a grateful climate within sports teams. This definition suggests that team members collectively demonstrate values, beliefs, and expected behaviors aligned with gratitude. The response options provided a means for respondents to indicate their agreement with the statement or answer the question, thereby assessing the degree to which they perceive a grateful climate. Additionally, to explore cultural values, beliefs, and behaviors related to

gratitude, the authors examined slang or idiomatic expressions associated with gratitude, considering their connotations and implications. Furthermore, in line with the Referent-shift Consensus Model (Chan, 1998), this study employed the consensus level term as the subject term in item stems. By utilizing terms such as "we," "everyone," or "people on our team," the researchers aimed to gauge participants' perception of gratitude expressed by fellow team members rather than focusing solely on individual experiences.

Then, participants were instructed to indicate their level of agreement with the gratitude expressed by team members (e.g., individuals within the team or everyone), rather than their personal gratitude. The item stems were formulated using subject terms such as "People on our team think that...," "On this team, people...," "Everyone on our team...," and so on. Additionally, to ensure the suitability of the items for the sports context, the content and representation of gratitude climate in the sports domain were specifically described, drawing from previous empirical studies (Hsu et al., 2020). For example, an item might state, "Everyone on our team is grateful for the training resources we have." As a result, the Sports Team Grateful Climate Questionnaire consisting of 9 items was developed (see Appendices).

After generating the 9 items, a panel of experts, comprising two psychology professors, one sports psychology professor, and one sports pedagogy professor, was invited to review and analyze each item in order to ensure content validity. Each expert independently rated the items on a scale of 1 to 10, indicating the extent to which they believed each item aligned with the concept of a grateful climate. To assess the content validity of the instrument, Kendall's W statistic was employed, which is particularly suitable when utilizing an expert panel. The results revealed a Kendall's W coefficient of .61 ($p < .05$), indicating that the 9 items of grateful climate

exhibit reasonable content validity (Weiler, 1995)[1]. Thus, the primary validity of the Sports Team Grateful Climate Questionnaire was examined.

Phase Two (Exploratory Factor Analysis)

Participants and Procedures

Phase two of the study received approval from the Institutional Review Board. Prior to athlete training, a research assistant presented an informed consent form to the athletes in a classroom setting, ensuring that no coach was present during this process. Participants' confidentiality and anonymity were safeguarded, as only the research team had access to the responses, with no identifiable information available. All respondents completed the questionnaire and received compensation in the form of 100 New Taiwan dollars (NTD), equivalent to approximately 3 USD, in the form of gift vouchers.

A total of 411 adolescent athletes from various sports were recruited for the study. Seven athletes who provided incomplete data were excluded, resulting in a final sample of 404 respondents (N = 404). Among these participants, there were 137 male athletes and 267 female athletes, with a mean age of 15.22 years (SD = 0.44). On average, athletes had a sport tenure of 4.80 years (SD = 2.82, three respondents did not report their sport tenure), and their average daily training time was 4.36 hours (SD = 1.22, two respondents did not report their average training time), with training taking place approximately 5.71 days per week (SD = 0.64).

In terms of the participants' highest level of competition, 66.1% (N = 267) reported competing at the national level, while 18.1% (N = 73) competed at the regional level, 2.7% (N = 11) at the international level, and 0.2% (N = 1) at the Asian level. Additionally, 12.9% (N = 52) of the participants did not compete at any reported level or did not provide information regarding their level of competition.

The athletes represented a variety of sports majors, including handball (*N* = 4), woodball (*N* = 4), track and field (*N* = 63), korfball (*N* = 19), gymnastics (*N* = 3), wrestling (*N* = 18), soccer (*N* = 17), tug of war (*N* = 8), judo (*N* = 32), archery (*N* = 30), shooting (*N* = 24), boxing (*N* = 2), table tennis (*N* = 12), volleyball (*N* = 9), modern pentathlon (*N* = 1), baseball (*N* = 12), swimming (*N* = 7), taekwondo (*N* = 58), soft tennis (*N* = 1), kendo (*N* = 3), rugby (*N* = 18), fencing (*N* = 4), weightlifting (*N* = 8), softball (*N* = 18), and basketball (*N* = 28).

Measurements

Grateful Climate

The 9-item Sports Team Grateful Climate Questionnaire developed from phase one was used to measure the gratitude climate in the sports teams with a Likert scale from 1 (strongly disagree) to 6 (strongly agree).

Data Analysis

Exploratory factor analysis (EFA) was conducted to examine the initial item quality and factor structure of the grateful climate in sports teams, following the recommendations of Fabrigar et al. (1999). The factor solutions were generated using SPSS 20.0 software, employing a Promax rotation. The choice of an oblique promax rotation method was made to allow for significant positive correlations among the potential factors (Gorsuch, 1983).

To determine the appropriate number of factors and attain a satisfactory factor solution, the Kaiser criterion (Gorsuch, 1983; Harman, 1976) and scree tests (Cattell, 1966) were employed. These methods aided in estimating the number of factors required to achieve an optimal factor structure.

Results

Attrition Analysis

According to Ployhart and Vandenberg's (2010) approach, the analysis revealed no significant differences between the two groups in terms of gender ($\chi 2 = 1.19$, $df = 1$, $p > .05$), sport tenure ($t = 0.55$, $df = 405$, $p > .05$), daily training hours ($t = -1.05$, $df = 407$, $p > .05$), and weekly training days ($t = 0.15$, $df = 408$, $p > .05$). However, a significant difference was observed in terms of age between respondents and non-respondents ($t = 10.18$, $df = 403$, $p < .05$). This discrepancy may be attributed to the unequal sample sizes between the two groups. Overall, it is suggested that the non-response in the data was not systematic. To further examine the factor validity of the Sports Team Grateful Climate Questionnaire, an exploratory factor analysis was conducted, as presented below.**Exploratory Factor Analysis**

The findings from the exploratory factor analysis are presented in Table 1. The skewness values (-0.68 to -0.99) and kurtosis values (0.01 to 0.81) for all indicators were below 2.0 and 7.0, respectively, indicating that the current data did not violate the assumption of multivariate normal distributions (West et al., 1995). Consequently, an exploratory factor analysis using the maximum likelihood estimation method was conducted.

The results of the final model indicated that a one-factor solution was recommended, as all items loaded onto a single factor. This conclusion was supported by the scree plot tests (Cattell, 1966), which demonstrated that the eigenvalues for the first factor (6.425) were substantially higher than those for the other factors, which were all below 1 (Gorsuch, 1983; Harman, 1976). The Cronbach's alpha coefficient for the one-factor solution was .95, indicating high internal consistency. Therefore, the one-factor solution provided the maximum number of stable and reliable factors for the Sports Team Grateful Climate Questionnaire. All nine items exhibited factor loadings ranging from .74 to .88, indicating strong validity. Therefore, all items were retained in the final questionnaire.

Insert Table 1

Phase Three (Multilevel Confirmatory Analysis, Nomological and Incremental Validity)

Participants and Procedures

The data for this study were collected as part of a larger independent project supervised by the first author[2]. The study received approval from the Institutional Review Board, and the data collection procedures were identical to those implemented in phase two.

Four hundred sixty-six adolescent athletes were initially recruited from various sports, and data from 431 athletes representing 56 teams who provided complete data at two time points were included in the analysis. The distribution of athletes across sports was as follows: handball (*N* = 5), woodball (*N* = 3), track and field (*N* = 59), korfball (*N* = 26), rowing (*N* = 3), wrestling (*N* = 9), soccer (*N* = 6), tug of war (*N* = 7), martial arts (*N* = 3), judo (*N* = 34), archery (*N* = 22), shooting (*N* = 16), table tennis (*N* = 20), volleyball (*N* = 16), baseball (*N* = 21), swimming (*N* = 10), taekwondo (*N* = 60), soft tennis (*N* = 3), kendo (*N* = 6), billiards (*N* = 6), rugby (*N* = 23), fencing (*N* = 11), weightlifting (*N* = 4), softball (*N* = 23), and basketball (*N* = 35). The team sizes ranged from three to twenty-six athletes, with a mean of 8 athletes per team.

In total, the sample consisted of 310 male athletes and 121 female athletes, with a mean age of 15.84 years *(SD* = 0.64). The average duration of sport participation was 4.69 years (*SD* = 2.53), and athletes reported an average training time of 4.17 hours per day (*SD* = 1.24) and 5.56 days per week (*SD* = 0.63). Regarding the highest level of competition, 66.6% of athletes (*N* = 287) reported competing at the national level, while 19.2% (*N* = 83) competed at the regional level, 5.1% (*N* = 22) at the international level, and 2.1% (*N* = 9) at the Asian level. Additionally,

7.0% (*N* = 30) of athletes either did not compete at any level or did not report their competition level.

Measurements

Grateful Climate

The 9-item Sports Team Grateful Climate Questionnaire measured in the previous phase was used.

Autonomy Support

Coach autonomy support was assessed using the 6-item short-form scale of the Sport Climate Questionnaire (SCQ) developed by Deci (2001). The Chinese translation of the short version of the SCQ was used in this study, which was provided by Chang et al. (2017). Previous research conducted with Chinese participants has demonstrated acceptable validity and reliability of the Chinese SCQ (Chang, 2016; Lin, 2010). The participants in the current study rated the items on a 6-point Likert scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). Cronbach's alpha for this measure was.91.

Subjective Vitality

A revised 6-item version of the subjective vitality scale, developed by Bostic et al. (2000), , was used to assess the athletes' subjective vitality. Previous studies conducted with Chinese populations, including Chinese adolescent athletes, have reported acceptable reliability and validity of this scale (Chen et al., 2013; Ling et al., 2015; Wong et al., 2014) as well as with Chinese adolescent athletes (Chang et al., 2018). Participants rated the items on a 7-point Likert scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Cronbach's alpha for this measure was.89.

Sports-specific Gratitude

The Gratitude Questionnaire-Sport (GQ-S), a six-item measure developed by Chen and Kee (2008) was employed in the present study to assess athletes' gratitude within the sports context. Previous research conducted with Chinese populations has demonstrated the reliability and incremental validity of this scale (Chen & Chang, 2017). The GQ-S consists of a single factor. Participants rated the items on a 7-point Likert scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Cronbach's alpha for this measure was.82.

Data Analysis

A multilevel confirmatory factor analysis was conducted to test the factor validity of the grateful climate, considering its nested data structure. Mplus 7 software (Muthén & Muthén, 2015) was used for the analyses. Multilevel confirmatory factor analysis is particularly suitable for analyzing nonindependent data, as it allows for the partitioning of the total sample covariance matrix into within-group and between-group covariance matrices(Hox, 2002). These covariance matrices were utilized to examine the factor structure of the Sports Team Grateful Climate Questionnaire at both the individual and group levels.

Before conducting the multilevel confirmatory factor analysis, an intraclass correlation coefficient (ICC) was calculated to determine the appropriateness of using multilevel analysis. The ICC assesses the proportion of between-group variance compared to the total variance(Dyer et al., 2005; Hox, 2002). A threshold of ICC value larger than 0.1 is typically considered necessary to justify the adoption of a multilevel confirmatory factor analysis.

In the current study, the maximum likelihood estimation method was chosen as the values of skewness (-1.03 ~ -0.71) and kurtosis (-0.08 ~ 1.01) for all indicators were below 2.0 and 7.0, respectively (Curran et al., 1996). Goodness-of-fit indices for the models were selected based on the recommendations of Hu and Bentler (1999). Specifically, model fit was evaluated using the

$\chi 2$ likelihood ratio statistic, the comparative fit index (CFI > .90), the root mean square error of approximation (RMSEA < .08), and the standardized root mean square residual (SRMR < .08).

Convergent validity was assessed by calculating Cronbach's alpha, Rho, and average variance extracted (AVE) values. Nomological validity was examined by conducting Pearson's correlation coefficient to test the relationship between the grateful climate of sports teams and the related variables.

Results

Attrition analysis

According to the perspective of Ployhart and Vandenberg (2010) , the results indicated that there were no significant differences between the two groups in terms of gender ($\chi 2 = 1.03$, $df = 1$, $p > .05$), age ($t = 1.55$, $df = 460$, $p > .05$), sport tenure ($t = 1.23$, $df = 450$, $p > .05$), daily training hours ($t = 0.67$, $df = 462$, $p > .05$), and weekly training days ($t = 1.28$, $df = 458$, $p > .05$). These findings suggest that the nonresponses in the current data were not systematic. Subsequently, multilevel confirmatory factor analysis was conducted to examine the factor validity of the Sports Team Grateful Climate Questionnaire.

Multilevel CFA

Table 2 presents the ICC values for all items (GC1-GC9), which are greater than 0.1, indicating that more than 10% of the variance in the data is attributable to group responses. Thus, multilevel confirmatory factor analysis is an appropriate approach to assess the factor validity (Dyer et al., 2005; Hox, 2002). The initial multilevel confirmatory factor analysis demonstrated satisfactory fit: $\chi 2(df) = 219.76$ (54), RMSEA = .08, SRMR within = .03, SRMR between = .05, CFI = .94. Convergent validity was then examined at both the within-level and between-level. Table 2 presents the factor loadings, Cronbach's alpha, rho, and AVE values.

At the within-person level, the factor loadings of all items ranged from .78 to .89. Cronbach's alpha was .96, Rho value was .96, and AVE value was .72. At the between-person level, the factor loadings of all items ranged from .888 to .998. Cronbach's alpha was .98, Rho value was .99, and AVE value was .94. These results from the multilevel analysis provide strong evidence of convergent validity, as indicated by the AVE and reliability coefficients, for both the within-level and between-level models.

Insert Table 2

Nomological and Incremental Validity

At the within-person level (see Table 3), the grateful climate demonstrated significant positive correlations with autonomy support ($r = .41$, $p < .01$), subjective vitality ($r = .37$, $p < .01$), and sports-specific gratitude ($r = .42$, $p < .01$). At the between-person level (see Table 4), the grateful climate also showed significant positive correlations with autonomy support ($r = .50$, $p < .01$), subjective vitality ($r = .41$, $p < .01$), and sports-specific gratitude ($r = .52$, $p < .01$). These findings suggest that while the grateful climate is related to these concepts, it is distinct and separate from them

---

Insert Tables 3 and 4

In addition, to examine the unique predictive power of the grateful climate in the within-level and between-level models while accounting for the shared variance with sports-specific gratitude, partial correlation analyses were conducted (see Table 5). In the within-person model,

the results revealed that the grateful climate was uniquely and positively associated with autonomy support (r = .29, p < .01) and subjective vitality (r = .24, p < .01) after controlling for sports-specific gratitude. Similarly, in the between-person model, the grateful climate exhibited significant and unique correlations with autonomy support (r = .41, p < .01) and subjective vitality (r = .27, p < .01) after adjusting for sports-specific gratitude. These findings indicate that the grateful climate provides incremental validity, as it explains a significant amount of unique variance in sports-specific outcomes at both the within-person and between-person levels, even when considering the influence of sports-specific gratitude.

Insert Table 5

Discussion

The primary aim of the current study was to develop a reliable and valid measure for assessing the grateful climate of sports teams. In phase one, a set of nine items was generated based on gratitude-related theory, the referent-shift consensus model (Chan, 1998), cultural beliefs, and previous empirical research on gratitude in the sports domain. The content validity of these items was evaluated by a panel of experts, and they were utilized to construct the Sports Team Grateful Climate Questionnaire. In phase two, exploratory factor analysis confirmed the one-factor structure of the questionnaire, providing initial support for its construct validity.

Subsequently, in phase three, a multilevel confirmatory factor analysis was conducted, demonstrating good fit between the Sports Team Grateful Climate Questionnaire and the collected data. Additionally, satisfactory values of Cronbach's alpha, Rho, and AVE were observed, indicating strong convergent validity at both the within-level and between-level

models. Furthermore, at the between-level model, the grateful climate was positively correlated with autonomy support and subjective vitality. Notably, even after controlling for sports-specific gratitude in the between-level model, the grateful climate of sports teams remained significantly associated with autonomy support and subjective vitality, thereby supporting its incremental validity. In conclusion, this study contributes to the existing literature on gratitude by introducing a reliable and valid instrument for assessing gratitude at the team level. The Sports Team Grateful Climate Questionnaire offers a valuable tool for researchers and practitioners interested in investigating the role of gratitude within sports teams.

Since the introduction of the multilevel model of gratitude by Fehr et al. (2017) , there has been a lack of appropriate measurement tools to capture the higher-level phenomenon of gratitude. Recognizing this gap, our study aimed to address this issue by developing the Sports Team Grateful Climate Questionnaire. While our approach differs somewhat from the original concept of collective gratitude, we adopt a sociocultural perspective to examine higher-level gratitude. In our study, we did not directly aggregate individuals' scores of sport-specific gratitude as a higher-level construct. Instead, we focused on measuring the shared perception of cultural norms related to gratitude that are embedded in individuals' minds, which we consider representing a grateful climate. Consequently, the Sports Team Grateful Climate Questionnaire assessed the shared perception of grateful norms among athletes and aggregated these items to reflect higher-level constructs. We believe that this approach is more suitable for the population we surveyed.

However, it is important to note that we did not claim that the referent-shift consensus model outperformed the direct consensus model in measuring higher levels of gratitude. Further research with a cross-cultural focus is necessary to determine the most appropriate solution for

capturing higher-level gratitude phenomena. In summary, our study addresses the lack of suitable measurement tools for assessing higher-level gratitude. By adopting a sociocultural perspective and developing the Sports Team Grateful Climate Questionnaire, we provide a valuable contribution to the field. Nonetheless, future research is needed to explore and refine the measurement of higher-level gratitude across different cultural contexts.

Empirically, a diverse sample of athletes from various sports teams was recruited to enhance the representativeness of the study. The results of the exploratory factor analysis indicated that the 9 items of the Sports Team Grateful Climate Questionnaire converged into a single factor, with all factor loadings exceeding the recommended threshold of .70 (Hair et al., 2006). Additionally, the calculated Cronbach's alpha coefficient of .95 demonstrated excellent internal consistency, providing support for the questionnaire's validity and reliability. However, given our objective to capture the higher-level psychological construct, considering the nested nature of the data within teams, we conducted multilevel confirmatory factor analysis to further examine the factor structure.

The results of the multilevel confirmatory factor analysis indicated that the proposed model exhibited good fit with the data at both the within and between levels. However, it is noteworthy that more than 10% of the variance in the data originated from group responses, suggesting that the grateful climate of sports teams is a collective phenomenon shaped by the team itself. Thus, it is inappropriate to solely consider the grateful climate as an individual perception; rather, it should be understood as a shared perception among team members (Aguinis et al., 2013; Chen et al., 2005). Consequently, averaging individuals' scores to represent a higher-level construct, such as the grateful climate of a sports team, may not be suitable. Instead, the aggregation approach employed in the current study is deemed a more appropriate method. These findings

lend support to the argument that researchers should carefully consider the levels of constructs when adapting theories, establishing concepts, and developing measurements (Ballard et al., 2019; González-Romá & Hernández, in press) , and the Sports Team Grateful Climate Questionnaire effectively addresses this requirement.

In terms of nomological validity, our findings revealed positive associations between the grateful climate and autonomy support, subjective vitality, and sport-specific gratitude at both the individual and team levels. Specifically, individuals who perceived a higher level of grateful climate within their team also reported greater perceptions of autonomy support, higher levels of subjective vitality, and stronger sports-specific gratitude. Furthermore, teams characterized by a higher degree of grateful climate were associated with greater levels of autonomy support and subjective vitality compared to teams with a lower level of grateful climate. These results align with theoretical expectations (Fenton et al., 2014; Fredrickson, 2003). It is important to note that our conceptualization of the grateful climate of sports teams primarily focuses on capturing higher-level phenomena within the team context. Therefore, demonstrating the satisfactory incremental validity of the grateful climate construct at the team level becomes particularly significant.

To further examine the relationship between the grateful climate of sports teams and related variables at the team level, we conducted partial correlations while controlling for sport-specific gratitude. The correlation coefficients slightly decreased (from .50 to .41 for autonomy support and from .41 to .27 for subjective vitality) but remained significant, supporting the incremental validity of the grateful climate construct within the sports team context. These findings suggest that the grateful climate may be influenced by situational factors and that subjective vitality can

be fostered through grateful interactions within teams, beyond the individual team members' levels of sports-specific gratitude.

Our results may appear to conflict with those of Fehr et al. (2017), who proposed that a grateful climate should be operationalized by aggregating the individual team members' trait gratitude. However, it is important to note that our conceptualization of the grateful climate as a unique construct differs from their approach. We adopted the consensus level term as the subject term to capture the participants' perception of another member's gratitude within the team, following the referent-shift model proposed by Chan (1998). Therefore, our results do not contradict those of Fehr et al. (2017), as we offer a distinct perspective on measuring the grateful climate. By providing preliminary evidence for quantifying the grateful climate within sports teams, our study makes a significant contribution to the existing literature on gratitude.

Implications and limitations

In terms of practical implications, our study contributes to the field by being one of the first to develop a valid and reliable measurement tool specifically designed to assess the grateful climate of sports teams. This opens up new avenues for investigating the antecedents and consequences of gratitude beyond the individual level. We now have the opportunity to explore whether teams that possess a grateful climate experience higher levels of happiness and well-being. Additionally, we can uncover psychological processes that may be similar to or different from those observed at the individual level.

For instance, Chen et al. (2015) discovered a positive relationship between athletes' trait gratitude and life satisfaction, mediated by perceived team cohesion. However, in their study, team cohesion was operationalized as an individual's perception rather than as a team-level construct(Carron & Brawley, 2000; Eys & Brawley, 2018). Therefore, it would be intriguing to

investigate whether grateful teams exhibit higher levels of cohesiveness and, consequently, contribute to athletes' well-being. In summary, our study offers a multilevel perspective that advances gratitude research and provides valuable insights for practitioners in the sports domain.

Several limitations of our study should be acknowledged. Firstly, all the measures employed in our study were based on self-reports, which introduces the possibility of common method bias (Lindell & Whitney, 2001). To enhance the validity of our findings, future research should incorporate multiple data sources, such as obtaining ratings from other team members or coaches, to provide a more comprehensive validation of the results. Additionally, the cross-sectional design of our study restricts our ability to establish causal relationships among the variables. Conducting longitudinal studies would be valuable in examining the temporal dynamics and directionality of the relationships.

Secondly, while autonomy support and subjective vitality were chosen to examine the nomological validity of the grateful climate, they may not fully capture the complete range of variables relevant to the construct. The absence of negative indicators limits our understanding of the broader aspects of the grateful climate. As our study was exploratory in nature, future research should consider incorporating multiple indicators and a more comprehensive set of variables to further investigate the nomological network of the grateful climate.

Lastly, we did not assess the cross-situational invariance of the Sports Team Grateful Climate Questionnaire. It would be valuable to examine whether our measurement tool can be applied in different contexts, such as work settings with slight modifications. This line of investigation would contribute to understanding the generalizability and robustness of the questionnaire across diverse units and situations.

Conclusion

In the present study, we aimed to advance the understanding of gratitude by developing a reliable and valid tool to measure the grateful climate of sports teams. Drawing on the work of Fehr et al. (2017) and the referent-shift model (Chan, 1998), we employed a multi-step process, including item development, expert evaluation, exploratory factor analysis, multilevel confirmatory factor analysis, and assessments of nomological and incremental validity. Through these rigorous procedures, we successfully quantified the grateful climate using the Sports Team Grateful Climate Questionnaire.

Our study represents a significant contribution to the gratitude literature as it expands the conceptualization of gratitude beyond the individual level to the team level. By developing a measurement tool that captures the unique characteristics of the grateful climate in sports teams, we open new avenues for research exploring the antecedents, consequences, and dynamics of gratitude within team contexts. This broader perspective sheds light on the collective aspects of gratitude and allows for a more comprehensive understanding of its implications.

Overall, our study fills an important gap in the literature by providing a reliable and valid instrument to measure the grateful climate of sports teams. This advancement contributes to the field of gratitude research and offers valuable insights for future investigations in team settings.

677 **References**

678 Aguinis, H., Gottfredson, R. K., & Culpepper, S. A. (2013). Best-practice recommendations for
679 estimating cross-level interaction effects using multilevel modeling. *Journal of*
680 *Management*, *39*(6), 1490-1528. https://doi.org/10.1177%2F0149206313478188
681 Ballard, T., Palada, H., Griffin, M., & Neal, A. (2019). An integrated approach to testing
682 dynamic, multilevel theory: Using computational models to connect theory, model, and
683 data. *Organizational Research Methods*, *24*(2), 251-284.
684 https://doi.org/10.1177/1094428119881209
685 Bostic, T. J., Rubio, D. M., & Hood, M. (2000). A validation of the subjective vitality scale using
686 structural equation modeling. *Social Indicators Research*, *52*, 313-324.
687 https://doi.org/10.1023/A:1007136110218
688 Carron, A. V., & Brawley, L. R. (2000). Cohesion: Conceptual and measurement issues. *Small*
689 *Group Research*, *31*(1), 89-106. https://doi.org/10.1177/104649640003100105
690 Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate Behavioral Research*,
691 *1*(2), 245-276. https://doi.org/10.1207/s15327906mbr0102_10
692 Chan, D. (1998). Functional relations among constructs in the same content domain at different
693 levels of analysis: A typology of composition models. *Journal of Applied Psychology*,
694 *83*(2), 234-246. https://doi.org/10.1037/0021-9010.83.2.234
695 Chang, M.-H. (2016). *The Influence of teacher autonomy for students' psychological need,*
696 *learning behavior and motivation in the field of science and technology* [Unpublished
697 doctoral dissertation]. National Pingtung University of Science and Technology.

Chang, W. H., Chi, L., Lin, S.-H., & Ye, Y.-C. (2017). Psychometric properties of the Acceptance and Action Questionnaire - II for Taiwanese college students and elite athletes. *Current Psychology*, *36*, 147-156. https://doi.org/10.1007/s12144-015-9395-x

Chen, G., Bliese, P. D., & Mathieu, J. E. (2005). Conceptual framework and statistical procedures for delineating and testing multilevel theories of homology. *Organizational Research Methods*, *8*(4), 375-409. https://doi.org/10.1177/1094428105280056

Chen, L. H., & Chang, Y.-P. (2017). Sport-domain gratitude uniquely accounts for athletes' well-being across two cultures: Incremental validity above the general gratitude. *The Journal of Positive Psychology*, *12*(6), 651-659. https://doi.org/10.1080/17439760.2016.1257052

Chen, L. H., & Hsu, S.-C. (2022). Athlete's gratitude: From individual differences to team climate. *Quarterly of Chinese Physical Education*, *36*(2), 189-200. https://doi.org/10.6223/qcpe.202206_36(2).0007

Chen, L. H., & Kee, Y. H. (2008). Gratitude and adolescent athletes' well-being. *Social Indicators Research*, *89*(2), 361-373. https://doi.org/10.1007/s11205-008-9237-4

Chen, L. H., Kee, Y. H., & Chen, M.-Y. (2015). Why grateful adolescent athletes are more satisfied with their life: The mediating role of perceived team cohesion. *Social Indicators Research*, *124*(2), 463-476. https://doi.org/10.1007/s11205-014-0798-0

Chen, Y., Yao, M., & Yan, W. (2013). Materialism and well-being among Chinese college students: The mediating role of basic psychological need satisfaction. *Journal of Health Psychology*, *19*(10), 1232-1240. https://doi.org/10.1177/1359105313488973

Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods*, *1*(1), 16-29. https://doi.org/10.1037/1082-989X.1.1.16

Deci, E. L. (2001). *The sport climate questionnaire*. Retrieved March 11, 2006 from. http://www.psych.rochester.edu/SDT/measures/auton_sport.html.

Dyer, N. G., Hanges, P. J., & Hall, R. J. (2005). Applying multilevel confirmatory factor analysis techniques to the study of leadership. *The Leadership Quarterly*, *16*(1), 149-167. https://doi.org/10.1016/j.leaqua.2004.09.009

Eys, M. A., & Brawley, L. R. (2018). Reflections on cohesion research with sport and exercise groups. *Social and Personality Psychology Compass*, *12*(4), e12379. https://doi.org/https://doi.org/10.1111/spc3.12379

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, *4*(3), 272-299 https://doi.org/http://doi.org/10.1007/s10803-009-0816-2

Fehr, R., Fulmer, A., Awtrey, E., & Miller, J. (2017). The grateful workplace: A multilevel model of gratitude in organizations. *Academy of Management Review*, *42*(2), 361-381. https://doi.org/10.5465/amr.2014.0374

Fenton, S. A. M., Duda, J. L., Quested, E., & Barrett, T. (2014). Coach autonomy support predicts autonomous motivation and daily moderate-to-vigorous physical activity and sedentary time in youth sport participants. *Psychology of Sport and Exercise*, *15*(5), 453-463. https://doi.org/10.1016/j.psychsport.2014.04.005

Fredrickson, B. L. (2003). Positive emotions and upward spirals in organizational settings. In K. Cameron, J. Dutton, & R. Quinn (Eds.), *Positive organizational scholarship: Foundations of a new discipline*. CA: Berrett-Koehler.

Fredrickson, B. L. (2004). Gratitude, like other positive emotion, broadens and builds. In R. A. Emmons & M. E. McCullough (Eds.), *The Psychology of Gratitude* (pp. 145-166). Oxford University Press.

González-Romá, V., & Hernández, A. (in press). Conducting and evaluating multilevel studies: Recommendations, resources, and a checklist. *Organizational Research Methods*. https://doi.org/10.1177/10944281211060712

Gorsuch, R. L. (1983). *Factor analysis* (2 ed.). LEA.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis (6th ed.)*. NJ: Pearson Prentice Hall.

Harman, H. H. (1976). *Modern factor analysis*. University Of Chicago Press.

Hox, J. (2002). *Multilevel analysis: Techniques and applications*. Lawrence Erlbaum.

Hsu, S.-C., Kuo, C.-C., Ni, Y.-L., & Chen, L. H. (2020). The power of gratitude in sports: A qualitative exploration of Olympic athletes' gratitude experiences. *International Journal of Sport Psychology*, *51*(1), 47-68. https://doi.org/10.7352/IJSP.2020.51.047

Hu, L. t., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1-55. https://doi.org/10.1080/10705519909540118

Lin, C.-Y. (2010). *Contextual effects of perceived teacher autonomy support and autonomy support learning climate on university students' learning motivation in physical education* [Unpublished doctoral dissertation]. National Taiwan Sport University.

Lindell, M. K., & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs. *Journal of Applied Psychology*, *86*(1), 114-121. https://doi.org/10.1037/0021-9010.86.1.114

765 Ling, Y., Huebner, E. S., Liu, J., Liu, W.-L., Zhang, J., & Xiao, J. (2015). The origins of hope in
766 adolescence: A test of a social–cognitive model. *Personality and Individual Differences*,
767 *87*, 307-311. https://doi.org/10.1016/j.paid.2015.08.016
768 Luria, G. (2019). Climate as a group level phenomenon: Theoretical assumptions and
769 methodological considerations. *Journal of Organizational Behavior*, *40*(9-10), 1055-
770 1066. https://doi.org/10.1002/job.2417
771 McCullough, M. E., Emmons, R. A., & Tsang, J.-A. (2002). The grateful disposition: A
772 conceptual and empirical topography. *Journal of Personality and Social Psychology*,
773 *82*(1), 112-127. https://doi.org/10.1037/0022-3514.82.1.112
774 McCullough, M. E., Kilpatrick, S. D., Emmons, R. A., & Larson, D. B. (2001). Is gratitude a
775 moral affect? *Psychological Bulletin*, *127*(2), 249-266. https://doi.org/10.1037/0033-
776 2909.127.2.249
777 McCullough, M. E., Tsang, J.-A., & Emmons, R. A. (2004). Gratitude in intermediate affective
778 terrain: Links of grateful mood to individual differences and daily emotional experience.
779 *Journal of Personality and Social Psychology*, *85*(2), 295-309.
780 https://doi.org/10.1037/0022-3514.86.2.295
781 Muthén, L., & Muthén, B. (2015). *Mplus user's guide (7th ed.)*. Muthén and Muthén.
782 Ployhart, R. E., & Vandenberg, R. J. (2010). Longitudinal research: The theory, design, and
783 analysis. *Journal of Management*, *36*(1), 94-120.
784 https://doi.org/10.1177/01492063093521
785 Weiler, R. M. (1995). Determining consensus: Applying Kendall's coefficient of concordance.
786 *Health Values: The Journal of Health Behavior, Education & Promotion, 19*(2), 53–56.

West, S. G., Finch, J. F., & Curran, P. J. (1995). Structural equation models with nonnormal variables: Problems and remedies. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues and applications* (pp. 56-75). Sage.

Wong, W.-c., Li, Y., Sun, X., & Xu, H. (2014). The control processes and subjective well-being of Chinese teachers: evidence of convergence with and divergence from the key propositions of the motivational theory of life-span development. *Frontiers in Psychology*, *5*. https://doi.org/10.3389/fpsyg.2014.00467

Wood, A. M., Froh, J. J., & Geraghty, A. W. A. (2010). Gratitude and well-being: A review and theoretical integration. *Clinical Psychology Review*, *30*(7), 890-905. https://doi.org/10.1016/j.cpr.2010.03.005

Appendices

1 在我們團隊中，成員都覺得飲水思源是重要的事情
Everyone on our team thinks that being grateful and expressing gratitude is important.

2 在我們團隊中，成員對現在擁有的訓練資源都心懷感激
Everyone on our team is grateful for the training resources we have.

3 團隊能有現在的表現，大家都覺得前人的努力功不可沒
Everyone on our team thinks that our accomplishments would not have been possible without the efforts of our predecessors.

4 在我們團隊中，成員都是互相幫忙不求回報地
Everyone on our team helps each other without expecting anything in return.

5 在我們團隊中，大家都覺得懂得感恩是重要的。
People on our team think that being grateful and expressing gratitude is important.

6 多年後如果有機會，大家都會盡力回報團隊的栽培
If there are opportunities in the future for them to do so, everyone will do their best to repay the team for their training.

7 在這個團隊中，成員經常對他人的貢獻表示感謝
On this team people always express gratitude for the contributions of others.

8 對於前輩們建立的基礎，大家都是滿懷感謝的。
People are grateful for the foundation that our predecessors have built.

9 對於來自各方對團隊的支持，大家都十分感恩。
People are grateful and express gratitude for the support given to our team from others.

Footnotes

1. The English version of the grateful climate at sport measure utilized in this study has not been validated. Therefore, further research is needed to validate its psychometric properties in an English-speaking context.
2. The data for phase three of 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. In the current study, the second wave of variables from the project was utilized. It is important to note that the Gratitude Questionnaire-Sport used in this study has been reported in another independent article that aims to capture the growth of athlete's gratitude. However, it is crucial to highlight that the two studies contribute to the literature on gratitude in different domains, ensuring their originality. Furthermore, neither the analysis nor the findings presented in this study have been published in any prior work.

Table 1

Descriptive Statistics, Factor Loadings, Reliability Coefficients of Exploratory Factor Analysis (*N* = 404)

Item	*M*	*SD*	Skewness	Kurtosis	λ	% of Variance	α
Item 1	4.56	1.24	-0.69	0.18	.78	67.90	.95
Item 2	4.58	1.27	-0.68	0.01	.84		
Item 3	4.72	1.20	-0.71	0.02	.74		
Item 4	4.57	1.30	-0.78	0.13	.77		
Item 5	4.68	1.31	-0.92	0.34	.88		
Item 6	4.66	1.23	-0.76	0.11	.84		
Item 7	4.61	1.26	-0.81	0.25	.85		
Item 8	4.74	1.24	-0.99	0.81	.85		
Item 9	4.85	1.18	-0.94	0.47	.86		

Table 2

Descriptive Statistics, Interclass Correlation Coefficients, Factor Loadings, Reliability Coefficients, and AVE of Multilevel Confirmatory Factor Analysis (*N* = 431)

Item	*M*	*SD*	Skewness	Kurtosis	ICCs	λ		α		Rho		AVE	
						Within-level	Between-level	Within-level	Between-level	Within-level	Between-level	Within-level	Between-level
Item 1	4.63	1.17	-0.73	0.20	.13	.78	.988	.96	.98	.96	.99	.72	.94
Item 2	4.69	1.24	-0.83	0.33	.20	.86	.996						
Item 3	4.80	1.13	-0.89	0.72	.15	.78	.957						
Item 4	4.55	1.31	-0.76	-0.01	.13	.82	.899						
Item 5	4.70	1.23	-0.85	0.21	.13	.89	.997						
Item 6	4.70	1.18	-0.84	0.51	.11	.89	.998						
Item 7	4.63	1.23	-0.71	-0.08	.12	.89	.998						
Item 8	4.78	1.17	-0.87	0.42	.10	.86	.888						
Item 9	4.90	1.12	-1.03	1.01	.14	.86	.997						

Table 3

Assessment of Criterion Validity in the Within-Level Model (*N* = 430 ~ 431)

	N	*M*	*SD*	1	2	3
1. Gratitude climate	431	4.71	1.05	--		
2. Autonomy support	431	4.35	1.08	.41**	--	
3. Subjective vitality	430	4.77	1.18	.37**	.35**	--
4. Sports-specific gratitude	430	5.68	1.00	.42**	.40**	.41**

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

Table 4

Assessment of Criterion Validity in the Between-Level Model (*N* = 56)

	N	*M*	*SD*	1	2	3
1. Gratitude climate	56	4.66	0.58	--		
2. Autonomy support	56	4.37	0.55	.50**	--	
3. Subjective vitality	56	4.72	0.52	.41**	.08	--
4. Sports-specific gratitude	56	5.65	0.47	.52**	.31*	.37**

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

Table 5

The Partial Correlations among the Variables in the Within-Level Model and Between-Level Model

	Gratitude climate (within model)	Gratitude climate (between model)
1. Autonomy support	.29**	.41**
2. Subjective vitality	.24**	.27*

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

Note: Sports-specific gratitude was controlled in both within-level and between-level model.