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# A bifactor analysis of goal difficulty and commitment in athletes' imagery ability

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*This study investigated the relationships between goal difficulty, goal commitment, and sport imagery ability using a bifactor model for the Japanese cultural concept of ganbaru across different competitive levels. Eight hundred Japanese collegiate athletes competing at local, regional, national, and international levels participated in the study. The results indicated that goal difficulty did not vary across competitive levels, whereas goal commitment and four types of imagery ability (skill, strategy, goal, and mastery imagery) showed significant differences. The bifactor analysis using structural equation modelling revealed different patterns across competitive levels. These findings suggest that while goal difficulty may hinder imagery generation, goal commitment contributes significantly to imagery ability, particularly at the international level. Moreover, ganbaru appears to influence imagery ability at lower and intermediate levels of competition (local, regional and national). Thus, athletes' roles of goal difficulty and commitment influence imagery generation, and cultural background can have a significant impact.*

KEY WORDS: Goal setting, Mental rehearsal, Athletic training, Visualization, motivation.

Major League Baseball champion for 2024 Shohei Ohtani, one of the most influential figures in sports today, expressed his mindset leading up to his first World Series appearance by stating, "I just really focused on playing each and every single game, doing the best that I can (originally expressed in Japanese using the term ganbaru), and imagining that I would be standing on this stage" (MLB, 2024). His competitive spirit and achievement not only highlight the concept of ganbaru, but also underscore the roles of imagery and goal setting in sports psychology (Cumming et al., 2002; Harwood et

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al., 2003). Building on this, the current research was designed to examine how the Japanese motivational concept of ganbaru, which can be understood within the framework of goal-setting theory, influences athletes' ability to generate imagery.

Ganbaru is a multifaceted Japanese cultural concept that shares conceptual similarities with goal-setting theory, which posits that difficult goals and commitment to them enhance performance (Locke & Latham, 1990). Beyond the simple translation of "doing your best," ganbaru encapsulates the idea of fully committing to a task and persisting until completion, even in the face of adversity (Albach, 1994; Elliott, 2004). The Japanese proverb "fall down seven times, stand up eight" is a Japanese proverb, widely used in daily life, that reflects the cultural value of effort over innate ability and embodies the belief that success can be achieved through perseverance (Brown, 2004; Ono, 2018). Such culturally rooted beliefs as ganbaru may parallel the mechanisms proposed in goal-setting theory (Locke & Latham, 1990; Williamson et al., 2024), particularly the emphasis on goal difficulty and goal commitment.

The simple principle that setting difficult goals, along with commitment to them, enhances performance has been supported by more than five decades of empirical research, consistently demonstrating broad generalizability across tasks and populations (Locke & Latham, 2019). Goal difficulty is highly motivating; individuals tend to become more committed when they perceive their goals as sufficiently challenging (Delose & VanDellen, 2023; Lee et al., 2015). Empirical research across various sports settings substantiates this theoretical claim. Previous studies found that higher goal difficulty improves performance accuracy in volleyball, table tennis service learning (Costa et al., 2023; Liu et al., 2012). Additionally, Bédard-Thom et al. (2022) demonstrated that difficult goals lead to optimal performance in endurance sports. While setting difficult goals and committing to them generally yields benefits, it is important to ensure that the goal falls within the optimal range (i.e., a moderately difficult goal). When goals exceed an individual's capabilities or appear unattainable, the relationship between goal difficulty and performance may result in curvilinear commitment and a decline in motivation (Lee et al., 2015; Locke & Latham, 2019; Seijts & Latham, 2000).

These complex dynamics can be better understood through the culturally embedded motivational function of ganbaru, and the way in which individuals generate imagery that reflects this concept. According to a cross-cultural study (Toyama et al., 2024), individuals from non-Japanese cultural backgrounds are more likely to interpret unattainably difficult circumstances as signals to abandon their goals. This finding is consistent with Kyllo and

Landers' (1995) meta-analysis which demonstrated that overly difficult goals can result in goal disengagement. In contrast, Japanese participants tended to reinforce their commitment by comparing an imagined desired future with present difficulties—interpreting such challenges not as reasons to give up, but as opportunities to better themselves (Heine et al., 2001; Toyama et al., 2024).

Mental contrasting, which involves comparing an imagined desired future with present difficulties, is a key process for fostering strong goal commitment (see Fantasy Realization Theory; Oettingen et al., 2009). During this phase, mental imagery plays a central role, as individuals are required to integrate multiple sensory modalities to simulate the desired future in the absence of direct perception (Cumming & Ramsey, 2008). Wakefield et al. (2013) demonstrated that imagining a situation as closely as possible—especially the relevant actions and emotional responses—enhances performance. For example, imagery can help refine skill execution, improve muscle memory, and regulate arousal levels, ultimately supporting progress toward the desired future (Cumming & Williams, 2012, 2013). Cumming and Ramsey (2008) found that athletes experience self-awareness during imagery processes. Latham et al. (2017) reported that individuals consciously reflect on the difficult goals they have set for themselves when engaging in task. In this context, ganbaru is likely to be reflected in the imagery of Japanese athletes; it operates as a self-regulatory mechanism that shapes self-perception, prompting individuals to actively think and build strategies for achieving their goals (Popkewitz & Brennan, 1997; Qi, 2006).

This perspective is grounded partly in the propositions of the Revised Applied Model of Deliberate Imagery Use (Cumming & Williams, 2012, 2013). RAMDIU describes the relationship between imagery function and outcomes as being dependent on the meaning of the image and its fit for the individual and the situation. Therefore, the effectiveness of imagery can vary based on the meaning attributed to it and its relevance to an individual's goals, potentially leading to considerable differences between individuals. This variability is also reflected in previous research, especially in studies showing that higher-level athletes tend to use imagery more frequently and with greater ease than lower-level athletes (Hall et al., 1998; Williams & Cumming, 2011). This distinction is evident across five types of sport imagery: cognitive-specific (e.g., imagining oneself refining a particular skill), cognitive-general (e.g., imagining alternative plans or strategies), motivational-specific (e.g., imagining oneself winning a medal), motivational-general arousal (e.g., imagining the excitement associated with performing), and motivational-general mastery (e.g., imagining staying positive after a setback).

Building on these theoretical foundations, the present study adopts a bifactor modeling approach to disentangle the general and specific contributions to imagery ability among Japanese athletes (see Figure 1). The central hypothesis posits that the general factor of ganbaru represents a shared latent trait underpinning both goal difficulty and goal commitment. This general factor, in conjunction with the specific factors, is expected to account for individual differences in imagery ability. Given that previous research on sport imagery ability has reported minor gender differences and has demonstrated that athletes competing at higher levels exhibit greater imagery ability than those at lower levels (e.g., Williams & Cumming, 2011; Lee & Horino, 2023). This modeling framework enables the examination of the pervasive influence of ganbaru on imagery generation across different competitive levels and genders. By foregrounding ganbaru as a central construct, the present research advances understanding of how culturally embedded motivational factors interact with goal-related constructs to shape imagery ability within the context of sport psychology.

## Method

### Participants

This study included 800 participants (456 males and 344 females) with an average age of 18.90 years (standard deviation; *SD* = 1.27). Participants had engaged in sports for 9.72 years (*SD* = 4.68), and were engaged at four competitive levels: local (102), regional (385), national (222), and international (91). To be eligible for participation, individuals were required to meet all the following criteria: (1) current enrollment as undergraduate students at a university in the Kanto region of Japan, (2) active affiliation with a university sports club, and (3) regular participation in organized training and/or competition. Individuals who failed to meet any of these criteria, or who submitted incomplete responses, were excluded from the final analysis.

### Measures

#### *The Japanese version of the Sport Imagery Ability Questionnaire (SIAQ-J)*

The SIAQ-J (Lee & Horino, 2023) is the Japanese version of the original English SIAQ (Williams & Cumming, 2011). This 15-item questionnaire evaluates athletes' ability to imagine various sports-related scenarios. It includes five subscales, each with three items: skill imagery (e.g., imagine refining a particular skill), strategy imagery (e.g., imagine devising alternative plans), goal imagery (e.g., imagine being interviewed as a champion), emotional imagery (e.g., imagine the positive emotions I feel while doing my sport), and mastery imagery (e.g., imagine staying positive after a setback). Athletes assess their ease of generating these images on a scale of 1 (*very hard*) to 7 (*very easy*), leading to an average rating for each imagery type. The

SIAQ-J has been proven to have an identical structure to the original, providing a reliable and valid assessment of imagery ability among Japanese athletes. The five subscales of the SIAQ-J reported satisfactory internal consistency, demonstrating composite reliability (CR) and average variance extracted (AVE) indicators that surpassed .70 and .50, respectively (Lee & Horino, 2023).

### *Goal Difficulty Measurement*

The 4-item goal difficulty scale listed by Locke and Latham (2013) was used to assess participants' perceived difficulty in achieving their goals. This scale, which consists of a single-factor structure was initially developed based on Lee and Bobko (1992), was reexamined by Kwan et al. (2013). It offers an externally referenced point of view by asking respondents to rate their goal difficulty compared to someone with average abilities —an approach designed to capture the notion of moderately difficult goals. In the present study, the original wording of the scale was adapted for a sports context by replacing references to "students" with "athletes." Participants were instructed to consider only the average athlete in their position who has a similar level of ability and skill (e.g., from the perspective of this average athlete, achieving my goal would require enormous effort). Responses were measured on a 5-point Likert scale ranging from "*strongly disagree*" to "*strongly agree*." Kwan et al. (2013) reported a Cronbach's alpha value of .9 for the reliability of this measurement.

### *Goal Commitment Measurement*

The 5-item goal commitment measure, originally developed by Hollenbeck et al. (1989), was subsequently validated by Klein et al. (2001) to capture the extent to which individuals were committed to their goals. This single-factor measurement focuses on individuals' determination toward their goals and the intensity and persistence of their commitments (e.g., quite frankly, I don't care if I achieve this goal or not) and it was modified for contextual adaptation in this study to directly relate to the athlete's goal setting (e.g., quite frankly, I don't care if I achieve my goal in sports or not). Responses were measured on a 5-point Likert scale, from "*strongly agree*" to "*strongly disagree*." Klein et al. (2001) reported a Cronbach's alpha of .74 for this measurement.

## Procedure

The sampling process began after obtaining ethical approval from the university to which the authors were affiliated. The participants were recruited from several universities in the Kanto region, which is the most densely populated area in Japan. Individuals who met the inclusion criteria were affiliated with sports clubs as collegiate athletes. Data collection was executed over three months, accommodating the athletes' schedules to minimize disruptions to their training and competition commitments. The investigator directly contacted the university sports club and collected data using convenience sampling. The potential participants received information sheets to ensure that they understood the voluntary nature of their participation. Participants provided written informed consent prior to participation, and were informed that their data would be kept anonymous and used exclusively for research purposes. The data collection process was completed within approximately 15 min per participant. Additionally, participants were informed that they would retain the right to withdraw their consent and discontinue participation at any point during the study. After excluding incomplete responses from the initial pool of respondents ($n$ = 37), the final sample consisted of 800 participants.

### Data analysis

First, data screening was conducted using SPSS 26 to assess normality, identify outliers, and ensure the suitability of the data for further statistical procedures. The $W$-test (Shapiro & Wilk, 1965) for the normal distribution of $p$-values was < .05, indicating that the data deviated from normality. However, the distribution shapes, with skewness ranging from -1.192 to .187 and kurtosis ranging from -.954 to 1.057, suggest that the data do not exhibit extreme deviations indicative of potential outliers. This implies an approximately normal distribution, allowing for further statistical analysis (George & Mallery, 2019). Further, the $Z$-scores for all variables ranged from -3.11 to 3.09, remaining within the standard threshold for identifying extreme outliers ($Z > \pm3.29$; Field, 2013). Additionally, the test for multivariate outliers using Cook's Distance revealed that all values were significantly below the recommended threshold ($D > 1.0$; Cook & Weisberg, 1982), indicating that no highly influential observations were detected in the dataset.

Next, confirmatory factor analyses (CFAs) were performed using AMOS to evaluate the construct validity and reliability of the goal difficulty, goal commitment, and SIAQ-J subscales. Multivariate analyses of variance (MANOVAs) were then conducted to examine group differences in goal difficulty, goal commitment, and the five types of imagery ability based on gender and competitive level. Finally, structural equation modeling (SEM) was employed to test a bifactor model of ganbaru, which included a general factor and two specific factors (goal difficulty and goal commitment) predicting imagery ability. This was followed by multi-group invariance testing to compare model parameters across four competitive levels (local, regional, national, and international) and gender.

## Results

### Measurement evaluation

Using Analysis of Moment Structures (AMOS; IBM Corp., ver. 27.0), confirmatory factor analyses (CFAs) were conducted on the SIAQ-J, goal difficulty, and goal commitment subscales to establish their respective goodness of fit and internal consistency. The procedure for verifying factorial and convergent validity before investigating the proposed model is critically important in the structural equation modeling (SEM) approach (Hair et al., 2014). Mardia's coefficients indicated significant deviations from multivariate normality, suggesting potential non-normality in the joint distribution of variables. However, univariate kurtosis values near zero suggested minimal deviations at the individual variable level (Stevens, 2002; Westfall & Henning, 2013). Therefore, the maximum likelihood estimation method was used to evaluate the goodness of fit for each measurement, as it can still provide reliable estimates under mild departures from normality. This evaluation focused on five well-established principal indices (Byrne, 2010; Kline, 2023; Maroco, 2014). These indices include the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI), both of which are required to exceed .90 for a good fit. Additionally, the Chi-Square to Degrees of Freedom Ratio (CMIN/df) should optimally fall below five. Furthermore, standardized root mean square residual (SRMR) and root mean square error of approximation (RMSEA) of .08 or less are considered acceptable for both values.

The results of separate CFAs revealed that the model representing goal difficulty had the following values: CMIN/*df* = 3.437 ($\chi^2 = 6.875$, $df = 2$, $p < .032$), CFI = .996, TLI = .987, SRMR = .015, and RMSEA = .055. The goal commitment model showed a model fit with CMIN/d*f* = 4.710 ($\chi^2 = 9.419$, $df = 2$, $p < .009$), CFI = .993, TLI = .967, SRMR = .021, and RMSEA=.068, indicating that the measurement for the intended purpose was confirmed. Finally, the results of CFA conducted on five subscales of SIAQ-J produced good fit indices, indicating that the model adequately fits the data: $\chi^2 = 217.12$ (75), $p < .001$, CFI = .977, TLI = .967, SRMR = .027, and RMSEA = .049. A CR value greater than .70 indicates that the items are reliably measuring the construct, and an AVE above .50 suggests that the construct explains a majority of the variance in its indicators (Fornell & Larcker, 1981; Hair et al., 2014). Table I shows the values of CR and AVE for each subscale calculated from this data.

### *Group Differences*

Four separate MANOVAs were conducted to examine the effects of gender and competitive level on goal difficulty, goal commitment, and imagery ability. For each analysis, either goal difficulty and goal commitment or the five imagery ability variables (skill, strategy, goal, affect, and mastery imagery) served as the dependent variables: (1) gender × 2 variables (goal difficulty and goal commitment), (2) gender × 5 variables (five types of imagery ability), (3) competitive level × 2 variables, and (4) competitive level × 5 variables.

*Gender differences.* The effect of gender on two goal-related variables—goal difficulty and goal commitment—was first examined. Box's M test was significant ($p = .002$), despite relatively equal group sizes, indicating a violation of the assumption of homogeneity of covariance matrices. However,

TABLE I
*Psychometric Properties of Goal Difficulty, Goal Commitment, and Imagery Ability*

| Variables | Level of Competition | | | | | MANOVA | | |
|---|---|---|---|---|---|---|---|---|
| | Total | 1 | 2 | 3 | 4 | F-Statistics | | Post Hoc |
| | n = 800 | n = 102 | n = 385 | n = 222 | n = 91 | Multivariate | Univariate | Tukey HSD |
| | Mean (Standard Deviation) | | | | | | | |
| Goal Difficulty | 3.95 (.722) | 3.80 (.792) | 3.99 (.720) | 3.94 (.722) | 3.95 (.630) | (Roy's = .012) 3.07* | 1.92 | |
| Goal Commitment | 3.82 (.750) | 3.64 (.745) | 3.81 (.729) | 3.88 (.782) | 3.91 (.744) | | 2.78* | 1<3 |
| Skill Imagery | 4.34 (1.24) | 4.06 (1.06) | 4.31 (1.23) | 4.37 (1.24) | 4.73 (1.34) | | 4.98** | 1<4, 2<4 |
| Strategy Imagery | 3.86 (1.30) | 3.27 (1.17) | 3.79 (1.29) | 4.04 (1.21) | 4.40 (1.39) | | 14.70*** | (1<2, 3, 4), 2<4 |
| Goal Imagery | 4.25 (1.47) | 3.59 (1.45) | 4.15 (1.43) | 4.51 (1.41) | 4.83 (1.55) | (Pillai's = .092) 5.02*** | 15.11*** | (1<2, 3, 4), (2<3, 4) |
| Affect Imagery | 4.87 (1.26) | 4.67 (1.25) | 4.83 (1.23) | 4.94 (1.28) | 4.06 (1.36) | | 1.93 | |
| Mastery Imagery | 4.33 (1.30) | 3.96 (1.25) | 4.37 (1.28) | 4.36 (1.33) | 4.52 (1.31) | | 3.58* | (1<2, 3, 4) |

*Note.* Levels 1 through 4 represent the local, regional, national, and international levels of competition, respectively. Levels 2 and 3 correspond to the Regional Leagues and National Championships in the UK BUCS system.
Roy's = Roy's Largest Root; Pillai's = Pillai's Trace. $p < .05$*, $p < .01$**, $p < .001$***.

since Pillai's Trace is robust to such violations, the multivariate results remain interpretable (Tabachnick & Fidell, 2013).

The multivariate test using Pillai's Trace revealed a statistically significant effect of gender (Pillai's Trace = .034, $F(2, 797) = 13.99$, $p < .001$, $\eta^2 = .034$). Follow-up univariate ANOVAs indicated that: Goal commitment differed significantly by gender, $F(1, 798) = 27.92$, $p < .001$, $\eta^2 = .034$, with females ($M = 3.98$, $SD = .67$) reporting higher commitment than males (M = 3.70, SD = .78). In contrast, goal difficulty did not significantly differ by gender, $F(1, 798) = 1.84$, $p = .176$, $\eta^2 = .002$.

The second MANOVA was conducted to examine gender differences across five imagery ability: skill imagery, strategy imagery, goal imagery, affect imagery, and mastery imagery. Box's M test was not significant ($p = .163$), indicating that the assumption of homogeneity of covariance matrices was met. The multivariate test using Pillai's Trace revealed a statistically significant main effect of gender, Pillai's Trace = .037, $F(5, 794) = 6.154$, $p < .001$, $\eta^2 = .037$. Follow-up univariate ANOVAs showed that: Strategy imagery differed significantly by gender, $F(1, 798) = 8.89$, $p = .003$, $\eta^2 = .011$, with males ($M = 3.98$, $SD = 1.33$) reporting greater imagery generation than females ($M = 3.71$, $SD = 1.24$). Goal imagery also differed significantly, $F(1, 798) = 4.36$, $p = .037$, $\eta^2 = .005$, with males ($M = 4.35$, $SD = 1.44$ reporting greater imagery generation than females ($M = 4.13$, $SD = 1.53$). Mastery imagery showed a significant gender difference, $F(1, 798) = 5.99$, $p = .015$, $\eta^2 = .007$, with males ($M = 4.43$, $SD = 1.28$) scoring higher than females ($M = 4.20$, $SD = 1.32$). There were no significant gender differences in skill imagery ($F(1, 798) = .15$, $p = .696$, $\eta^2 = .001$) or affect imagery ($F(1, 798) = .93$, $p = .335$, $\eta^2 = .001$).

*Competitive level difference.* A separate MANOVA was conducted to examine the effect of competitive level (Levels 1 to 4) on goal difficulty and goal commitment. Box's M test ($p = .169$) assumed equality of covariance matrices. However, the multivariate test employing Pillai's Trace for competitive level fell just short of statistical significance ($p = .055$). Given this marginal result, an alternative multivariate statistic, Roy's Largest Root, was applied (Johnstone & Nadler, 2017). This test yielded a significant effect, suggesting that competitive level may still have a meaningful impact on the combined dependent variables of goal difficulty and goal commitment. Roy's Largest Root = .012, $F(3, 796) = 3.072$, $p = .027$, $\eta^2 = .011$. Follow-up a one-way ANOVA revealed that goal commitment differed significantly across competitive levels, $F(3, 796) = 2.78$, $p = .040$, $\eta^2 = .010$. with higher competitive levels generally associated with greater commitment. Although, differences in goal difficulty were not statistically significant, ($F(3, 796) = 1.92$, $p = .125$, $\eta^2 = .007$), post hoc comparisons indicated that athletes in Level 3 and 4 reported significantly higher goal commitment than those in Level 1. While differences in goal difficulty were less consistent.

The differences across competitive levels (Levels 1 to 4) in five imagery ability subscales—skill imagery, strategy imagery, goal imagery, affect imagery, and mastery imagery—were than tested. The Box's M test ($p$ =.09)confirmed covariance matrix equality. Multivariate analysis using Pillai›s Trace showed a significant effect of competitive level (Pillai›s Trace =.092, $F(15, 2382) = 5.023$, $p <.001$, $\eta^2 =.031$). Follow-up univariate ANOVAs showed significant group differences: Skill imagery, $F(3, 796) = 4.98$, $p = .002$, $\eta^2 = .018$, with higher scores observed at Level 4 compared to Levels 1 and 2. Strategy imagery, $F(3, 796) = 14.70$, $p < .001$, $\eta^2 = .052$ with Level 1 significantly lower than Levels 2, 3, and 4; Level 2 also lower than Level 4. Goal imagery, $F(3, 796) = 15.11$, $p < .001$, $\eta^2 = .054$, with Level 1 scoring lower than Levels 2, 3, and 4; Level 2 also lower than Levels 3 and 4. Mastery imagery, $F(3, 796) = 3.58$, $p = .014$, $\eta^2 = .014$ with Level 1 reporting lower scores than Levels 2, 3, and 4. Affect imagery did not differ significantly across competitive levels, $F(3, 796) = 1.93$, $p = .123$, $\eta^2 = .123$. Table 1 displays the post hoc comparisons conducted using Tukey's HSD, highlighting the observed patterns of difference.

### *Structure and Testing Adequacy*

The structural model was tested to establish an explanatory model for the relationships among goal difficulty, goal commitment, and the five types of imagery ability (see figure 1). It includes a bifactor structure with the ganbaru-general factor, which integrates both goal difficulty and goal commitment, offering a comprehensive understanding of ganbaru. Since the influence of the general factor does not obscure the contributions of specific factors such as goal difficulty and goal commitment, this approach can provide clear insight into the explanatory model (Rodriguez et al., 2016). The adequacy of this bifactor model was tested using five indices (Byrne, 2010; Kline, 2023; Maroco, 2014). The data demonstrated a satisfactory fit for the model ($\chi^2/df = 2.775$, CFI = .954, TLI = .944, SRMR = .047, and RMSEA = .047).

To demonstrate the conceptual and empirical superiority of the bifactor model, we compared it with first-order and second-order alternative models (see Table II). The bifactor model showed consistently better fit indices than both first-order (uncorrelated: CFI = .849; correlated: CFI = .881) and second-order (uncorrelated: CFI = .922; correlated: CFI = .929) models. These results support the use of the bifactor model in representing the underlying structure of goal difficulty, goal commitment, and imagery ability in this sample.

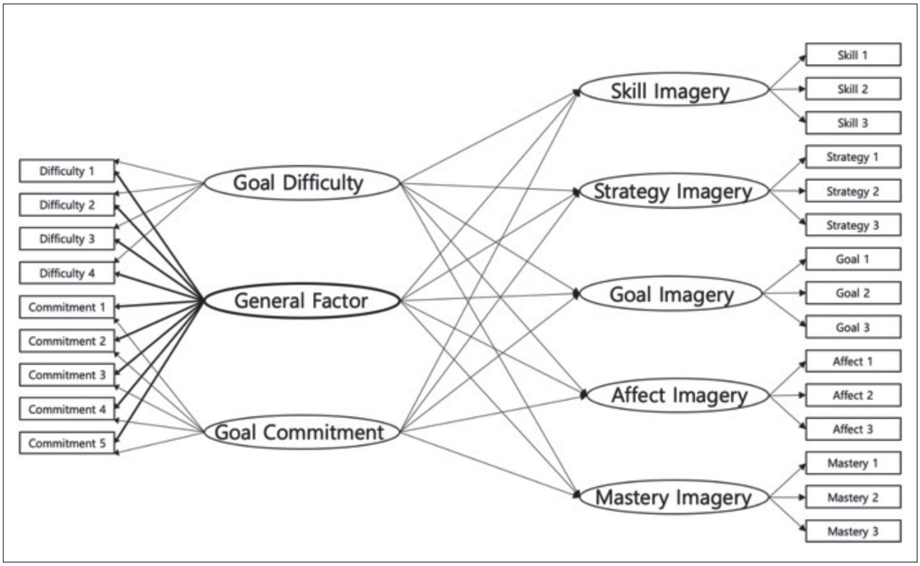


Figure 1 - *Hypothesised Bifactor Model of Goal Difficulty, Goal Commitment, and Imagery Ability*.
*Note.* The general factor represents the Japanese cultural concept of ganbaru, while goal difficulty and goal commitment are specific factors.

The maximum likelihood with the bootstrapping method was used to calculate the estimates with 95% bias-corrected confidence intervals to obtain the significance level of the standardized beta coefficients (Gritti et al., 2023; Preacher & Hayes, 2008). Following the inspection of each effect, it was revealed that the goal difficulty-specific factor significantly predicted a negative relationship with all five types of imagery ability: skill = -.564, strategy = -.537, goal = -.622, affect = -.621, and mastery = -.684. The goal commitment-specific factor demonstrated mixed results, with skill, strategy, and mastery imagery showing a negative relationship, while goal and affect imagery had a positive relationship. However, only strategy (-.154, $p$ = .005) and mastery imagery (-.105, $p$ = .08) were significant. Meanwhile, the ganbaru-general factor significantly predicted all five types of imagery ability: skill = .358, strategy = .292, goal = .529, affect = .611, and mastery = .458. Figure 2 provides a summary of these findings.

Table II
*Fit Indices for the Hypothesized Model and Alternative Structural Models*

| Hypothesized model (bifactor) | | $\chi^2/df$ | CFI | TLI | RMSEA | SRMR |
|---|---|---|---|---|---|---|
| Alternative Structures | | 2.775 | .954 | .944 | .047 | .047 |
| First-order | uncorrelated | 6.521 | .849 | .826 | .083 | .108 |
| | correlated | 5.373 | .881 | .862 | .074 | .068 |
| Second-order | uncorrelated | 3.824 | .922 | .911 | .059 | .091 |
| | correlated | 3.586 | .929 | .919 | .057 | .078 |

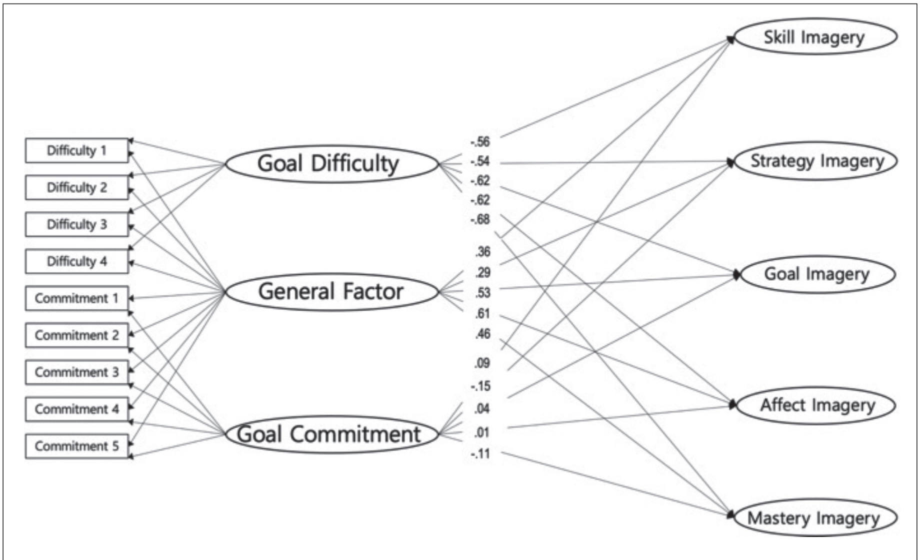


Figure 2 - *Regression Coefficients of Ganbaru, Goal Difficulty, and Goal Commitment on Imagery Ability.*
*Note.* Goal commitment effects on strategy and goal imagery were not significant; its effect on skill imagery was marginal ($p < .10$). All others were significant (95% bias-corrected *CI*).

## Group Variance and Effect Differences

To confirm whether comparing regression coefficients across groups was statistically valid, the multi-group invariance testing was performed across the four competitive levels. First, the test confirmed that factor loadings are consistent across competitive levels ($p = .114$). This means that the constructs are measured in the same way across all groups, allowing for valid comparisons of regression coefficients. Further, a significant difference in regression weights ($p$ = .009) indicated that these influences change based on an athlete's competitive level. Additionally, significant differences in covariances ($p$ = .008) suggested that the incorporation between goal difficulty and goal commitment is not the same across all groups. Meanwhile, residual variance differences ($p$ = .069) indicated that the overall model remains stable across groups. Lastly, significant measurement error differences ($p$ < .001) suggested that response consistency varies by competitive level.

Finally, the regression paths were compared across the four different competitive levels. The estimation of standardized regression weights, standard errors, biases, and significance levels are presented in Table III. The goal difficulty-specific factor generally had a negative impact on all five types of imagery ability at the regional and national levels, except for affect and mastery at the local level. Notably, at the international level, GOAL DIFFICULTY-specific factor had no significant effect on any of the five types of imagery ability. The goal commitment-specific factor had a significant positive effect, particularly at the international level, influencing all five types of imagery ability. However, only skill (at the local level) and strategy (negatively at the regional level) showed significant effects at the lower levels. The ganbaru-general factor generally had a positive effect on imagery ability, with stronger influences at the regional and national levels than at the local level. However, it did not significantly influence any imagery ability at the international level.

When this model was analyzed separately by gender, the overall pattern and significance of the effects were largely similar across groups, except for a significant negative association between goal commitment-specific factor and strategy imagery among male athletes. Nevertheless, the factor loadings test ($p$ < .001) indicated that measurement invariance was not achieved across gender, implying that the underlying latent constructs may not be measured equivalently in male and female groups. Accordingly, direct comparisons should be interpreted with caution, as such differences limit the reliability and interpretability of cross-group comparisons.

## Discussion

Athletes' imagery generation ability was examined in relation to the Japanese cultural concept of ganbaru, which comprises goal difficulty and goal commitment. The bifactor model provided a comprehensive framework for

TABLE III
*A Bifactor Analysis on Imagery Ability across Competitive Levels*

| | Standardized Regression Weights (Standard Error), Bias | | | | |
|---|---|---|---|---|---|
| Goal Difficulty ⇒ | Skill | Strategy | Goal | Affect | Mastery |
| Local | -.226† (.18) .049 | -.305* (.18) .058 | -.344* (.20) .072 | -.368 (.25) .057 | .175 (.24) .035 |
| Regional | -.522** (.09) .020 | -.458** (.09) .020 | -.579** (.10) .024 | -.510** (.11) .026 | -.566** (.11) .026 |
| National | -.553*** (.09) .022 | -.572*** (.08) .023 | -.666*** (.08) .027 | -.770*** (.07) .019 | -.782*** (.07) .025 |
| International | -.151 (.25) -.051 | -.184 (.20) -.036 | -.035 (.24) -.044 | -.015 (.26) -.065 | -.014 (.27) -.053 |
| Goal Commitment ⇒ | Skill | Strategy | Goal | Affect | Mastery |
| Local | .302* (.17) .005 | .227 (.19) .016 | .047 (.25) .052 | -.027 (.28) .104 | .090 (.29) .091 |
| Regional | -.091 (.10) -.016 | -.232* (.09) -.011 | -.054 (.12) -.022 | -.053 (.12) -.023 | -.125 (.12) -.022 |
| National | .011 (.09) .005 | .043 (.09) .007 | -.083 (.11) .018 | -.088 (.11) .022 | .096 (.10) .014 |
| International | .786** (.24) -.117 | .652** (.20) -.098 | .629† (.28) -.116 | .802** (.22) -.114 | .846*** (.21) -.113 |
| General Factor ⇒ | Skill | Strategy | Goal | Affect | Mastery |
| Local | .281† (.19) -.069 | .197† (.18) -.069 | .405** (.16) -.063 | .653* (.19) -.048 | .400† (.21) -.059 |
| Regional | .340** (.08) -.005 | .233** (.07) -.009 | .526** (.09) -.004 | .665** (.08) -.006 | .522** (.08) -.007 |
| National | .279** (.09) .007 | .275** (.08) .008 | .469** (.11) .013 | .444** (.11) .020 | .287* (.11) .019 |
| International | .175 (.24) .035 | .071 (.21) .025 | .248 (.24) -.044 | .154 (.27) .051 | .018 (.28) .061 |

*Note.* The significance of standardized beta was obtained with 95% bias-corrected confidence intervals.
*** $p < .001$, ** $p < .010$, * $p < .050$, † $p < .100$

understanding how ganbaru relates to imagery ability, and the findings supported this model: the ganbaru-general factor positively predicted all types of imagery ability (skill, strategy, goal, affect, and mastery imagery). Notably, the effect of the ganbaru-general factor was strongest among athletes at local to national competitive levels—where the greatest goal commitment was demonstrated—but was not significant at the international level.

To provide further insight into the role of ganbaru, a series of MANOVAs was conducted to examine whether goal difficulty, goal commitment, and five types of imagery ability (skill, strategy, goal, affect and mastery imagery) varied as a function of gender and competitive level (local, regional, national, and international). Higher competitive levels were associated with significantly greater goal commitment, while goal difficulty did not differ significantly across levels. Post hoc analysis showed that athletes at national and international levels reported higher goal commitment than those at the local level. For imagery ability, significant differences were observed across competitive levels for skill, strategy, goal, and mastery imagery, with higher-level athletes consistently demonstrating greater imagery ability. However, affect imagery did not significantly differ by competitive level. Females reported significantly higher goal commitment than males, while no significant gender difference was found for goal difficulty. In terms of imagery ability, males demonstrated greater strategy, goal, and mastery imagery compared to females, but no significant gender differences were observed for skill or affect imagery.

Consistent with prior research, differences in imagery ability across competitive levels—as well as gender-related differences—have been well documented in the literature (Williams & Cumming, 2011; Lee & Horino, 2023). The finding that females exhibited greater commitment to athletic performance goals aligns with previous studies showing that female university students majoring in physical education tend to demonstrate higher levels of intrinsic motivation and conscientiousness (Kuśnierz et al., 2020). Importantly, there were no significant differences in goal difficulty across competitive levels. The mean score for goal difficulty was 3.95 on a 5-point scale, indicating that while athletes generally set challenging goals, these goals were not perceived as extremely difficult. The lack of significant differences suggests that, regardless of competitive level, athletes tend to set challenging goals as a baseline. Researchers have emphasized the positive impact of setting sufficiently difficult goals in the context of goal setting and performance (Kingston & Wilson, 2008; Locke & Latham, 2002; Weinberg, 2013). Therefore, the relatively consistent level of goal difficulty observed in this study's sample provides an optimal context for examining differences in imagery ability across competitive levels. This stability in goal difficulty ensures that observed differences in imagery ability are less likely to be confounded by variations in perceived goal difficulty among athletes.

Structural equation modeling using the bifactor method effectively captured the underlying structure of the data. The goal difficulty and goal commitment, along with the ganbaru-general factor, were positioned in specific factors. Notably, the goal difficulty-specific factor was not linked with greater imagery ability. Rather, the regression path revealed a significant negative relationship between goal difficulty and all five types of imagery ability. Moreover, these findings exhibited a similar negative pattern across four different competitive levels. These consistent negative effects of goal difficulty may be explained by the nature of imagery generation, as athletes tend to produce imagery that is easier to form and sustain or control (Cumming & Williams, 2013). An athlete's ability to generate imagery reflects their capacity to form it with ease in relation to their sport (Williams & Cumming, 2011). Therefore, even when individuals set difficult goals and are highly motivated, the imagery itself may become more difficult to form and sustain or control effectively. In contrast, goal clarity has been shown to significantly predict imagery ability (Lee & Horino, 2023). Thus, goals that are both clear and challenging may be more effective to imagery generation.

The goal commitment-specific factor influenced imagery ability particularly among international-level athletes (all five types). Klinger (2013) elucidated that an individual's commitment to particular goals enhances sensitivity to cues linked to outcomes and mental activities. However, goal commitment showed only minimal influence on imagery ability among athletes below the national level. Given that goal clarity is a significant predictor of imagery ability (Lee & Horino, 2023), relying solely on goal commitment may lead to ambiguity in an athlete's ability to generate imagery. Cumming and Williams (2012, 2013) further emphasized that the relationship between imagery function and outcomes as being dependent on the meaning of the image and it's fit for the person and the situation. This suggests that, as seen among international-level athletes—at the highest competitive level—their goals are well-defined (and thoroughly reflected upon) and are accompanied by goal commitment. Well-defined goals are more effective in improving performance than setting easy or vague goals (Bédard-Thom et al., 2022; Costa et al., 2023; Liu et al., 2012). Given that goal commitment is critical for athletes to explore diverse strategies for achieving their objectives (Locke & Latham, 2019), it is highly likely that effective imagery is generated in this process.

The results also indicated that at the local level, goal commitment had a positive effect on skill imagery, suggesting its role in the learning and practice of new skills. However, at the regional level, goal commitment had a negative effect on strategy imagery. The negative effect of goal commitment on strategy imagery at the regional level may be understood within the context of sport developmental process—particularly when there is a misalignment between tactical understanding and execution (Ramos et al., 2024). This suggests that, at this intermediate competitive level, greater commitment may hinder strategy-related imagery, as athletes begin to engage with more complex tactical demands. Wakefield and Smith (2012) recommend tailoring imagery content to align with an individual's stages of the learning process. In this context, the international-level athletes are highly likely to have tailored imagery content aligned with their performance. It is plausible that, through accumulated experience, international-level athletes—despite being closely associated with difficult goals—have come to recognize that such goals can hinder their ability to generate effective imagery. Nevertheless, this does not mean that difficult goals are entirely excluded from their imagery processes. Rather, as highlighted in prior research and the present study, goal commitment is often strengthened by the pursuit of challenging goals. Thus, among international-level athletes, difficult goals may be effectively tailored and integrated into their imagery through their goal commitment. These findings may be further understood in light of the study by Toyama et al. (2024), which demonstrated that mental contrasting—comparing an imagined desired future with present difficulties—can enhance motivation to pursue challenging goals. In this sense, the international-level athletes in the present study may exhibit a similar adaptive strategy, utilizing difficult goals to reinforce goal commitment and optimize their imagery, rather than perceiving such challenges as insurmountable obstacles. These mental contrasts have been shown to bolster commitment to desired outcomes, particularly when individuals have high expectations of success (Oettingen et al., 2009). Therefore, to generate greater strategy imagery ability, it is important to have goal commitment along with high expectations of success.

The ganbaru-general factor, which comprises goal difficulty and goal commitment, positively influenced imagery ability at the local, regional, and national levels. James (2007) defines ganbaru as the "best experience" wherein significant challenges are overcome through persistent effort. However, the ganbaru-general factor did not influence imagery ability at the international level. Competing regularly at high levels may standardize goals among international athletes, making the ganbaru-general factor a less distinguishing variable in predicting imagery ability. This observation does not detract from the significance of ganbaru—since high-level competition inherently involves pursuing difficulty goals—but instead suggests that in such environments, the generation of effective imagery depends more on goal commitment. Researchers have highlighted the critical importance of maintaining a robust commitment to goals, particularly in situations that might give rise to negative or cynical imagery (Rhodes & May, 2022; Rhodes et al., 2021).

## Limitations

Several limitations should be noted in this study. First, because no standardized instrument currently exists to directly measure the cultural concept of ganbaru, this study employed translated goal-related measures as proxies. As a result, the construct validity of ganbaru may be limited, and interpretations should be made with caution. Second, although the sample included athletes from various competitive levels, it was restricted to collegiate athletes. This limits the generalizability of the findings to other populations, such as youth or elite professional athletes. Finally, all data were collected through self-report questionnaires, which may be subject to social desirability bias or inaccurate self-perceptions.

## Conclusions

This study provides new insight into how the Japanese cultural concept of ganbaru, as operationalized by goal difficulty and goal commitment, relates to athletes' imagery generation ability across different competitive levels. The findings highlight that the ganbaru-general factor plays a significant and positive role in predicting various types of imagery ability—particularly at local, regional, and national levels of competition, where strong goal commitment is most evident. In contrast, at the international level, effective imagery generation appears to depend more specifically on goal commitment rather than on the combined effects of ganbaru.

The results further suggest that, while athletes across all competitive levels tend to set challenging but not extremely difficult goals, these goal-setting tendencies form a stable baseline for exploring individual and group differences in imagery ability. Importantly, the negative relationship between goal difficulty and imagery ability emphasizes the need for athletes to set goals that are not only challenging but also clear and attainable, to facilitate effective imagery generation and performance enhancement. In this context, Locke and Latham (2019) have also highlighted the importance of setting specific goals, as clarity and specificity can further enhance motivation and achievement.

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