Relationship between Adaptation after Returning to Competition and Psycho-behavioral Attitudes during Injury Rehabilitation

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Abstract. [Purpose] The purpose of this study was to examine the relationship between adaptation after returning to competition and psychological and behavioral variables during the rehabilitation period. [Subjects] Athletes (N =113) that had experienced an injury (mean age = 20.22 years, SD = 1.07; mean weeks after stopping sports = 7.98 weeks, SD = 11.74) participated in this study. [Methods] The subjects were asked to respond to the athletic injury version of the Temporal Perspective Scale (TP-S), existing scales including the DDF-S, AIPA-S, and ARD-S, and the outcome indices for rehabilitation. [Results] The results of a cluster analysis indicated three modalities of temporal perspective (i.e., positive, neutral, and negative sequences). The results of an analysis of variance showed that the positive chain modality was adaptive for future dominance. The subjects in this group demonstrated higher levels of acceptance of injuries during the rehabilitation period than the other groups, devotion to rehabilitation, and awareness of the recovery in competitive performance and a feeling of personal growth. [Conclusion] The level of acceptance of injury during the rehabilitation period, as well as the devotion to rehabilitation, influenced adaptation after returning to competition.

Key words: Adaptation after returning to competition, Temporal perspective, Athletic rehabilitation

INTRODUCTION

The authors of a previous study demonstrated a positive relationship between athletic injury psychological acceptance (AIPA) and rehabilitation behaviors. They pointed out the effectiveness of psychological support aimed at acceptance of an injury1–4). However, to get a clear view of appropriate goals and tasks to support injured athletes, it is essential to examine their adaptive state after returning to competition instead of targeting short-term intervention effects, such as psychological stress reduction and devotion to rehabilitation behaviors. This is because some athletes worry about their competitive career not only during rehabilitation after injury but also after returning to competition. Moreover, some athletes cannot actively engage in competition5–6). These athletes, at least, have difficulties integrating their pre-injury selves (the past) into their present selves, which makes it impossible for them to look into the future. Some may also persist in the injury and the pre-injury self and still desire to maintain an internal connection with these points in time. Therefore, recovery of the temporal perspective related to injury is a significant index for predicting whether athletes, with high affinity for physical and athletic abilities, can adapt psychologically, both during rehabilitation and after returning to competition.

Since Frank7), various definitions of temporal perspective have been discussed. In this study, the perspective of the ribbon model proposed by Katsumata8) was used. He reviewed previous studies on temporal perspective and pointed out the following issues: ambiguity of the relationships between the past, the present, and the future; inclination to the future perspective; and a delay in research on clinical psychology and psychopathology. Therefore, he redefined temporal perspective as the “organically related integral of perspectives (regarding the past, the present, and the future) held by an individual, a group, or a society at one point during the passage of time (duration),” and he identified three perspectives (i.e., the past, the present, and the future)8). Attention should be given to his adaptive and maladaptive temporal perspective models in which a psycho-cybernetics standpoint was incorporated to explain the temporal perspective. For instance, the concepts of feedback (FB) and feedforward (FF) were used to explain the past and the future perspectives, respectively. This demonstrated that the way people hold a present perspective has a close relationship with the other perspectives by means of FB and FF. In the adaptive temporal perspective model, the three perspectives are integrated; a positive FB is given from the past perspective, which is mediated by the present perspective, and then, the FF is given to the future perspective. It was pointed out that this sequence always continues. On the oth-
In this study, factors experienced during the rehabilitation period were examined, as they can impact the state of adaptation after returning to competition. This will clarify the perspective of psychological intervention for rehabilitation medical care. Based on previous studies by the author of this study, we investigated the following factors: AIPA and athletic rehabilitation dedication (ARD) as variables describing psychological and behavioral attitudes during the rehabilitation period and perception of personality regarding the difficulty describing feelings (DDF) and perception of support including listening and acceptance as variables generating individual differences in attitude, emotional reactions, and coping behaviors.

Tatsumi clarified two factors of AIPA, the focus on the present and self-motivation, and confirmed the relationships among ARD, vision about rehabilitation and the competitive career after returning to competition. Here, the focus on the present is defined as the “feeling of compromise regarding the injury event.” Self-motivation is defined as “consistent sense of purpose for rehabilitation effort.” After injury, athletes develop problems maintaining a continuous sense of the self. More specifically, the state of the temporal perspective after returning to competition significantly relates to how much recovery was achieved for the sense of self-discontinuity due to injury during the rehabilitation stage. Regarding this point, Fujii’s discussion on the “perception of the continuity for successive athletic ability” is inspiring. He focused on how injured athletes perceive the continuous relationship of their athletic ability with the past or the present. “Negative cognition” is defined as the expectation that the level of athletic ability would return to the state just prior to that at the time of injury and continue to develop from there (i.e., seeking consecutiveness from the pre-injury state for athletic ability). “Positive cognition” is defined as the expectation that the decreased athletic ability of the present is connected to the future (i.e., perceiving a continuous relationship from the present). Especially, at the early stages of rehabilitation, injured athletes may consciously or unconsciously persist in the pre-injury self, and they tend to seek to place their athletic abilities on a continuum in the pre-injury condition. However, they start to recognize that in reality they should perceive their athletic ability from the present onward to be a continuation of the post-injury state. Inconsistencies occur here both for athletic ability and the sense of self-continuity. Unconscious conflicts consisting of both discontinuousness prospects form grief reactions such as impatience and anger, as well as regret and remorse. This leads to negative rehabilitation behaviors. Therefore, the task for injured athletes is to accept their injuries, and connect the break of continuity to the rebound point (i.e., the present). It can be considered that the aforementioned mentality of AIPA contributes significantly to the changes in perception of psychological time. The mentality of focusing on the present enables injured athletes to break away from the self that seeks the perspective from the point of injury in the past and psychologically transfer his or her perspective from the past to the present. Furthermore, it can be considered that the mentality of self-motivation strongly motivates the orientation from the present to the future. Based on these considerations, it was hypothesized that the level of acceptance of injury during the rehabilitation period firmly defines both rehabilitation behaviors and the temporal perspective after returning to competition, or more specifically, it defines the adaptive state.

Over the years, studies in the field of athletic rehabilitation have pointed out that expressing grief has a psychological healing aspect. In recent years, the effectiveness of interventions for cognitive integration that use emotional disclosure techniques has been examined. In short, expressing negative emotions about an injury can be expected to influence AIPA and adaptation after returning to competition. An important factor at such times is whether athletes have someone in their lives who would accept the personality features related to emotional expression and emotions; this is a variable generating individual differences in reactions to injury. Therefore, characteristics related to DDF and the perception of support including listening and acceptance were incorporated as variables in this study. Tatsumi reported a relationship between the DDF and inactive coping behaviors. In the field of competitive sports, there are unique subcultures. Howard and Nixon pointed out that societal control and force of rationality in an organization lies in the background, which can impose on and lead an injured athlete to accept an injury risk and pain and to take the risk of continued athletic activity in spite of an injury. In the study of Weinberg, Vemau, and Horn, athletes with a high athletic identity were reported to display a positive attitude towards continuation of sports regardless of an injury, and their actual tendency to do so. Influences of such social and cultural aspects on injured athletes may include the way they express their negative emotions and coping behaviors after injury. Mankad and Gordon explained the following. First, injured athletes take evasive actions toward injury to maintain the norm of the group and suppress their negative emotions for fear of receiving negative evaluations. Second, injured athletes
recognize that controlling emotions is an encouraged action in a team environment. At least in competitive sports environments, there appears to be no foundational atmosphere for freely expressing their worries and feelings about injuries. Therefore, it is hypothesized that such an environment has an impact on athletes forming certain characteristics of emotional communication, perceiving and using available support including listening and acceptance, and having certain attitudes toward injury and rehabilitation behaviors, which in turn affect their adaptive state after returning to competition.

Consequently, in this study, the adaptive state after returning to competition was classified according to the temporal perspective FB-FF theory. The purpose of this study was to examine the relationships between differences in individual variables, including characteristics of emotional expressions during the rehabilitation period (from the diagnosis and conservation period to the training period), perception of support including listening and acceptance, and the degrees of injury and psychological damage, as well as attitudinal variables including AIPA and ARD, and the outcome indices regarding the perceived physical recovery and the feeling of personal growth at the point of returning to competition.

SUBJECTS AND METHODS

Subjects

The criteria for the subjects were set as follows because the degree of injury and dedication to competitive sport are likely to influence the psychological state of the injured during rehabilitation and the psychological adaptive state after returning to completion:

(a) Active athletes that had experienced an injury and had stopped playing sports for longer than a week after entering university and had gone through athletic rehabilitations.

(b) Athletes who were not currently receiving rehabilitation for their injury and had returned to sports for longer than one week.

(c) Student athletes who belonged to the faculty of sports and exercise science at a sports science university and were expected to aspire to competitive sports and have strong competitive careers.

Former athletes who met all the above criteria participated in this study. The criteria for the period in which they stopped playing sports due to injury and their aspirations regarding competitive sports followed the criteria used in previous studies. First, prior to this study, an overview of this research was explained to each adviser of four prominent athletic clubs of a sport science university and to a medical scientist working as an instructor at the same university. Their consent to cooperate with this study was obtained (i.e., distribution and collection of the survey forms). When the study was implemented, subjects were asked to confirm whether they consented to participate in this research. As a result, 144 athletes with injury experiences were selected to participate in this study. This study was conducted after receiving ethical approval from the Research Ethics Committee of Kio University.

Methods

The following section describes the athletic injury version of the Temporal Perspective Scale (TP-S) used to assess adaptation after returning to competition; the Time Dominance Scale (TD-S); features of DDF during the rehabilitation period; indices related to perception of support, including listening and acceptance; indices of AIPA and ARD; and the implementation and analyses of this study.

First, the athletic injury version of the TP-S, consisting of 12 items, was developed based on Katsumata’s temporal perspective FB-FF theory. This scale consists of three subscales (i.e., the past perspective related to injury, the present perspective after returning to competition, and the future perspective, with four items for each). The scale was developed by adding context to an unpublished scale developed by Katsumata, an experienced clinical psychologist. Although Katsumata’s original TP-S included a subscale for assessing time dominance (three items), this subscale was used as an independent index in this study. The TD-S is an index for assessing the directionality of a respondent’s preoccupied thoughts on a past injury (i.e., past dominance), the present perspective after returning to competition (i.e., present dominance), and the future perspective (i.e., future dominance). Based on this scale by Katsumata, the following items were developed: “preoccupation with the past” (i.e., past dominance) as indicated by the statement, “I frequently think about having been injured and worry about it”; “preoccupation with the present” (i.e., present dominance) as indicated by the statement, “I hardly think about having been injured and about the future”; and “preoccupation with the future” (i.e., future dominance) as indicated by the statement, “I am always thinking about the future.” Subjects were asked to respond by indicating their current situation for these questions using a 7-point Likert-type response format ranging between 1 (not at all) and 7 (very much).

Second, the DDF Scale (DDF-S: five items), which is one of the subscales of the Toronto Alexithymia Scale 20 (TAS-20) developed by Bagby, Parker, and Taylor was used as an index for assessing the perception of personality regarding DDF during the rehabilitation period. The TAS-20 is used to measure alexithymia characteristics. The reliability and validity of the scale had been confirmed. The focus of this study was on evaluating personal traits related to emotional communications and emotional expressions rather than the characteristics of alexithymia itself. The DDF-S was regarded as an appropriate measure for assessing characteristics of the self in terms of difficulty describing, communicating, and expressing emotions. Subjects were asked to recall injury experiences, and based on their memories about the situation at the time, they were asked to respond to questions regarding the three scales mentioned above using a 7-point Likert-type response format ranging from 1 (not at all) to 7 (very much). Likewise, to assess perception of support including listening and acceptance, subjects were asked to divulge whether they had a person who listens and accepts their worries and emotional disclosures about their injuries using a 3-point Likert-type response format ranging from 1 (did not have a person) to 3 (had a
person). Those who responded with 3 (had a person) were asked to more concretely describe the person.

Third, the Athletic Injury Psychological Acceptance Scale (AIPA-S)3) consisting of seven items was employed to measure the degree of AIPA during the rehabilitation period. The AIPA-S is an index for assessing the degree of psychological acceptance specialized for athletic injury, and it consists of the following two subscales: “focus on the present” (four items) and “self-motivation” (three items). The reliability and validity of the AIPA-S has been confirmed. The Athletic Rehabilitation Dedication Scale (ARD-S) was also used to measure ARD, as it assesses the degree of dedication to rehabilitation. This scale consists of three items: rehabilitation participation as indicated by the statement, “I always participate in the scheduled rehabilitation unless I have a reason to be absent”; rehabilitation completion as indicated by the statement, “I sufficiently complete the scheduled rehabilitation plan”; and rehabilitation effort as indicated by the statement, “during the course of rehabilitation, I am trying to make as much effort as I can to complete the tasks.” In a study by Tatsumi2), the ARD-S was used as an external criterion to examine the validity of the AIPA-S. Subjects were asked to respond to questions using a 7-point Likert-type response format ranging from 1 (not at all) to 7 (very much).

Moreover, subjects were asked to indicate their perceptions of the degree to which the injury had healed and the recovery of competitiveness at the point of returning to competition as an index of rehabilitation outcome using an 11-point Likert-type response format ranging from 0 (0%) to 10 (100%). Subjects were also asked to indicate their perceptions about feelings of personal growth using a 7-point Likert-type response format ranging from 0 (no growth at all) to 6 (significant growth). “At the point of returning to competition” was defined as the immediate point at which injured athletes completed rehabilitation and returned to team practice; “after returning to competition” was defined as when subjects had been taking part in competitions for longer than a week. Subjects were also asked to respond to a question written on the face sheet of the survey regarding the degree of psychological damage that they recognized right after injury using a 4-point Likert-type response format ranging from 1 (not at all) to 4 (very much) and were asked to provide other information including the athletic events, the results of competition, the date of injury, the name of the injury, and the degree of the injury (i.e., the number of weeks sports activities were stopped based on a doctor’s diagnosis).

This study was conducted on an anonymous basis. The survey form distributed to former injured athletes was placed in an envelope with an attached letter requesting participation in this study. Those who consented to participate in the study were asked to take out the survey form and respond to the questions. When collecting the survey form, regardless of the responses, the subjects were asked to place the form in the original envelope and seal it. If the subjects had multiple injury experiences in the past, they were asked to pick one of the most memorable injury events and respond about that event.

The data analysis is described in the following section. First, the structures of the following scales were examined: the three subscales of the athletic injury version of the TP-S (i.e., the past, the present, and the future perspectives), which evaluates the adaptive state after returning to competition, and the existing DDF-S. This examination was conducted because the TP-S is a revised version of Katsumata’s scale, and the subjects were asked to respond to the DDF-S based on their memory about the situation at the time of injury. A principal component analysis was conducted for the items in each scale, and the validity of the scales was judged based on whether unidimensionality of each scale was confirmed. This is because the three segmentation units were used as a premise in the previous studies for the TP-S8) and one of the TAS-2022) subscales was used for the DDF-S. Regarding the reliability, the internal consistency of each scale was examined by using Cronbach’s coefficient α. In a related study, Tatsumi and Takenouchi15) confirmed the factorial invariance of AIPA-S for self-motivation (three items) and focus on the present (three items). The data of that study were utilized in this study. Therefore, the content structure of the scale was not reexamined. Next, correlation analyses were used to examine the relationship among the concept of time after returning to competition, each scale assessing psychological and behavioral factors during the rehabilitation period, and the rehabilitation outcome indices at the point of returning to competition. The total scores of the three subscales of the athletic injury version of the TP-S and the DDF-S scale, two subscales of the AIPA-S, and the complete AIPA-S scale were calculated. Then, the total scores were divided by the numbers of items. Raw data were used for the following scale scores: the three subscales consisting of the TD-S (i.e., the past, present, and future dominances), the perception of support including listening and acceptance, the three subscales comprising the ARD-S (i.e., rehabilitation participation, rehabilitation completion, and rehabilitation effort), the perception of injury healing and recovery of performance for competition, and perception of personal growth. Next, based on the three perspectives of the athletic injury version of the TP-S, a cluster analysis was used to identify the modality of the sequence of temporal perspectives (i.e., time perspective chain modalities) after returning to competition. Furthermore, ANOVA was used to examine the relationship between the modality of the sequence (i.e., time perspective chain modalities) and TD-S to enhance the validity of the three clusters identified as an optimal solution. Lastly, ANOVA was used to examine the relationships among the following variables: the modality of the sequence of temporal perspectives (i.e., time perspective chain modalities) at the point of returning to competition and the degrees of injury (i.e., the number of weeks that playing sports was stopped) and psychological damage at the time of injury, the DDF-S and perception of support during the rehabilitation period, the AIPA-S and ARD-S, and the perceptions of injury healing, the recovery of performance for competition, and the feeling of personal growth at the point to returning to competition.

The data were analyzed using IBM SPSS Statistics 20.0 and the null hypothesis was rejected at the α=0.05 significance level.
RESULTS

The data for 113 subjects (mean age = 20.22, SD = 1.07) who responded to all the scales used in this study were analyzed. The mean weeks without playing sports based on a doctor’s diagnosis was 7.98 weeks (SD=11.74). The athletic levels of the subjects’ teams were rather high (intercollege or pre-intercollege level). All the colleges to which the teams belonged had a tradition of playing sports. Therefore, all the teams had excellent coaches and were highly organized.

First, a principal component analysis was conducted to examine the structure of each subscale of the athletic injury version of the TP-S (i.e., the past, present, and future perspectives). As can be seen in Tables 1 (a), (b), and (c), the results indicated that each subscale was unidimensional. Principal component loadings of each scale were high and larger than 0.55. The internal consistency for each scale was also found to be satisfactory, ranging from α=0.67 to 0.71.

A principal component analysis was also conducted for five items of the DDF-S. The results indicated that the scale was unidimensional. Principal component loadings ranged from 0.69 to 0.88, and the internal consistency reliability of the five items was found to be satisfactory (α=0.85). More specifically, the items in the order of higher to lower principal component loadings were as follows: “I am not able to describe my feelings easily,” “I find it hard to describe how I feel about people,” “It is difficult for me to find the right words for my feelings,” “It is difficult for me to reveal my innermost feelings, even to close friends,” and “People tell me to describe my feelings more.” These results demonstrated the reliability and validity of the scale.

Second, Table 2 shows results concerning the correlations among the three subscales of the TP-S, TD-S, individual differences (the degrees of injury and perceived psychological damage at the time of injury, the DDF, and the perception of support), attitudinal variables (AIPA and ARD), and outcome indices (perceptions of injury healing, recovery of performance, and feeling of personal growth). Regarding the concept of time, the correlations among each temporal perspective subscale (i.e., the past, the present, and the future) were significant, with r ranging from 0.56 to 0.73. Significant correlations were also found between each temporal perspective and future dominance, with r ranging from 0.26 to 0.40. These results indicated that although each perspective is a theoretical segmentation unit, the perspectives could positively and synchronously influence one another. Moreover, higher levels of each perspective implied preoccupation with the future (i.e., future dominance) as the orientation of thoughts and behaviors. Next, we investigated the relationship between the concept of time and variables of individual differences and found statistically significant negative correlations among each perspective and the DDF, with r ranging from −0.20 to −0.30. However, the correlations among each perspective and the degree of injury, as well as each perspective and the degree of psychological damage, were not significant (ranging from r=−0.04 to 0.06 and from r=−0.01 to −0.12, respectively). The relationships between each perspective and indices of rehabilitation attitudes revealed the following statistically significant posi-

| Table 1 (a). Results of the principal component analysis of the past perspective scale regarding the temporal perspective |
|---------------------------------------------------------------|
| (N=113) Component loadings                                   |
| Items (α=0.67) Comp.1                                         |
|---------------------------------------------------------------|
| 10 | I take having been injured positively. 0.76                 |
| 4  | * I have a lingering feeling that was caused at the time of injury. 0.74 |
| 1  | * I feel that my injury has jeopardized my life so far. 0.73 |
| 7  | I think I could learn many things by having being injured. 0.59 |
| **Reverse scoring item**                                      |

| Table 1 (b). Results of principal component analysis of the present perspective scale regarding the temporal perspective |
|---------------------------------------------------------------|
| (N=113) Component loadings                                   |
| Items (α=0.68) Comp.1                                         |
|---------------------------------------------------------------|
| 2   | * I can’t find much meaning in my current life. 0.76         |
| 5   | * I feel my current life is boring. 0.73                     |
| 11  | I think there are some meaningful values in my current life. 0.72 |
| 8   | I have things to learn in my current life and I am satisfied with it. 0.65 |
| **Reverse scoring item**                                      |

| Table 1 (c). Results of the principal component analysis of the future perspective scale regarding the temporal perspective |
|---------------------------------------------------------------|
| (N=113) Component loadings                                   |
| Items (α=0.71) Comp.1                                         |
|---------------------------------------------------------------|
| 3   | * When I think about my future life, first, I become anxious and feel uneasy about it. 0.76 |
| 9   | I can look into my future life. 0.75                         |
| 6   | * I do not feel that many good things will happen in my future life. 0.72 |
| 12  | If things don’t proceed well in the future, they can be corrected at that time. 0.71 |
| **Reverse scoring item**                                      |
Table 2. Correlations between the concept of time after returning to competition and psychological and behavioral factors and indices during rehabilitation

| Psychometric properties | Time perspectives (N=113) | Time dominances (N=113) |
|-------------------------|----------------------------|-------------------------|
|                         | Ms±SD | Past perspective | Present perspective | Future perspective | Past dominance | Present dominance | Future dominance |
| **Concept of time**     |       |                 |                      |                    |               |                     |                   |
| TP-S                    |       |                 |                      |                    |               |                     |                   |
| Past perspective        | 4.89±1.18 | ---          | 0.56 ***           | 0.67 ***          | −0.09         | −0.08              | 0.26 **           |
| Present perspective     | 4.82±1.14 | ---          | ---                | 0.73 ***          | 0.11          | −0.10              | 0.37 ***          |
| Future perspective      | 4.75±1.16 | ---          | ---                | ---               | 0.06          | −0.03              | 0.40 ***          |
| TD-S                    |       |                 |                      |                    |               |                     |                   |
| Past dominance          | 4.23±1.75 | ---          | ---                | ---               | ---           | −0.17              | 0.02              |
| Present dominance       | 3.88±1.52 | ---          | ---                | ---               | ---           | ---                | 0.06              |
| Future dominance        | 4.66±1.31 | ---          | ---                | ---               | ---           | ---                | ---               |
| **Individual differences factors** |       |                 |                      |                    |               |                     |                   |
| Degree of injury        | 7.98±11.74 | −0.04       | 0.06               | 0.03              | 0.15          | 0.02               | 0.01              |
| Psychological damage    | 3.05±1.39 | −0.06       | −0.01              | −0.12             | 0.07          | −0.03              | 0.03              |
| DDF-S                   | 3.50±1.43 | −0.20 *     | −0.30 ***          | −0.28 **          | 0.20 *        | 0.16               | −0.06             |
| *Perception of support including listening and acceptance | 2.51±0.59 | 0.01       | −0.03              | −0.14            | −0.04         | 0.08               | −0.09             |
| **Attitudinal indices for rehabilitation** |       |                 |                      |                    |               |                     |                   |
| AIPA-S                  |       |                 |                      |                    |               |                     |                   |
| Self-motivation         | 4.86±1.45 | 0.41 ***   | 0.41 ***           | 0.46 ***          | −0.04         | 0.05               | 0.32 ***          |
| Focus on the present    | 4.67±1.48 | 0.42 ***   | 0.33 ***           | 0.46 ***          | −0.20 *       | 0.11               | 0.16              |
| AIPA overall score      | 4.74±1.32 | 0.47 ***   | 0.41 ***           | 0.49 ***          | −0.14         | 0.11               | 0.28 **           |
| ARD-S                   |       |                 |                      |                    |               |                     |                   |
| Rehabilitation participation | 5.34±1.66 | 0.17      | 0.16               | 0.27 **           | 0.01          | −0.08              | 0.13              |
| Rehabilitation completion | 4.95±1.46 | 0.22    | 0.12               | 0.27 **           | 0.02          | 0.04               | 0.20 *            |
| Rehabilitation effort   | 5.34±1.38 | 0.36 *** | 0.30 ***           | 0.38 ***          | −0.02         | −0.03              | 0.25 **           |
| Rehabilitation outcome indices |       |                 |                      |                    |               |                     |                   |
| Injury healing          | 7.79±1.92 | 0.39 *** | 0.21 *             | 0.24 *            | −0.19 *       | 0.01               | 0.19 *            |
| Recovery of performance for competition | 7.74±2.18 | 0.46 *** | 0.28 **           | 0.32 ***         | −0.23 *       | −0.01              | 0.18              |
| Feeling of personal growth | 5.13±1.22 | 0.50 *** | 0.46 ***           | 0.50 ***          | −0.06         | −0.06              | 0.34 ***          |

*p<0.05; **p<0.01; ***p<0.001. *Applies to this scale only (N=103)
Table 3. Descriptive statistics and results of ANOVA for three temporal perspectives related to the modality of the sequence of temporal perspectives

| Psychometric properties | Time perspective chain modality | Mse | Multiple comparison |
|-------------------------|--------------------------------|-----|---------------------|
|                         | C-1  (n=29)                   |     |                     |
| Past perspective        | 6.45 (0.51)                   | 50.52 | *** 1>2>3           |
| Present perspective     | 5.79 (1.05)                   | 29.08 | *** 1>2>3           |
| Future perspective      | 6.14 (0.74)                   | 44.16 | *** 1>2>3           |
|                         | C-2  (n=78)                   |     |                     |
| Past perspective        | 4.44 (0.66)                   |     |                     |
| Present perspective     | 4.63 (0.84)                   |     |                     |
| Future perspective      | 4.38 (0.74)                   |     |                     |
|                         | C-3  (n=6)                    |     |                     |
| Past perspective        | 3.33 (1.63)                   |     |                     |
| Present perspective     | 2.67 (0.52)                   |     |                     |
| Future perspective      | 2.83 (0.98)                   |     |                     |

***p<0.001

Descriptive correlations: each perspective and self-motivation for accepting an injury (from r=0.41 to 0.46), each perspective and focus on the present (from r=0.33 to 0.46), and each perspective and the total AIPA-S score (from r=0.41 to 0.49). Regarding the correlations among each perspective and ARD, rehabilitation effort was especially positively correlated with each perspective, with r ranging from 0.30 to 0.38. Lastly, the correlations among each perspective and rehabilitation outcome indices revealed the following statistically significant positive correlations: each perspective and the perception of recovery of performance for competition (from r=0.28 to 0.46) and each perspective and the feeling of personal growth (from r=0.46 to 0.50). Regarding the correlation between time dominance and variables of individual differences, a statistically significant positive correlation was found between past dominance and DDF (r=0.20). Similarly, the correlations among time dominance, the attitudinal indices for rehabilitation, and outcome indices revealed the following statistically significant negative correlation: preoccupation with the past (i.e., past dominance) and focus on the present in AIPA (r=-0.20) and preoccupation with the past (i.e., past dominance) and the perception of recovery of performance for competition (r=-0.23). Furthermore, correlations between preoccupation with the future (i.e., future dominance) and the following subscales of AIPA had statistically significant positive correlations: self-motivation, rehabilitation effort, and perception of feelings of personal growth (r=0.32, 0.25, and 0.34, respectively). These results assumed that the degrees of injury and psychological damage at the time of injury did not relate to adaptation after returning to competition, whereas athletes with a high level of DDF tended to persist in the past reality of being injured in the present, even after returning to competition, and had problems with maintaining the correct temporal perspective. Therefore, it can be assumed that they returned in a maladaptive way. It was hypothesized that athletes who are in an adaptive state after returning to competition following an injury would be more preoccupied with the future (i.e., future dominance) compared with those who are in a maladaptive state. It was also assumed that adaptive athletes would have a high level of AIPA and ARD during the rehabilitation period, that they would strongly perceive their recovery from the injury, that they would recover their competitive performance, and that they would have a feeling of personal growth at the point of returning to competition.

Next, adaptation after returning to competition was observed from the modality of the sequence of temporal perspectives (i.e., time perspective chain modality) on the basis of the correlation analyses described above. Moreover, individual differences, attitudinal indices, and outcome indices were examined for each modality (i.e., chain modality).

First, cluster analysis (complete-linkage method, squared Euclidean distance) was conducted to find the optimal solution for the modality of the sequence of temporal perspectives (i.e., time perspective chain modality) using scores of the three subscales of the athletic injury version of the TP-S as variables and all subjects as the cases. The optimal solution suggested three clusters. The results of one-way ANOVA were significant at an alpha level of 1% for the three levels of the TP-S. Based on the results of multiple comparison tests conducted with the LSD method, three clusters were used. These results are presented in Table 3. Considering the rating scale (ranging from 1 to 7; 4 was the median), the results for C-1 can be interpreted as the best modality of the sequence (i.e., time perspective chain modality), and C-3 can be considered maladaptive for the scores below 4 points for any perspective. The scores for C-2 were around the median, 4 points, for any perspective. The results of one-way ANOVA with the TD-S as the dependent variable were significant at an alpha level of 1% for preoccupation with the future (i.e., future dominance). The results of multiple comparison tests conducted with the LSD method indicated that subjects in C-1 were more preoccupied with the future (i.e., future dominance) than those in C-2 and C-3 (see Table 4). Previous studies about temporal perspective in youths25, 26 have indicated that preoccupation with the future is desirable, and in this study, C-1 was suggested to be the most adaptive modality of the sequence (i.e., time perspective chain modality). Based on these results, the names of the three identified modalities of the sequence of temporal perspective (i.e., time perspective chain modalities) and an overview of them are presented in Table 5. Compared with the other modalities, the positive modality of the sequence (i.e., positive chain modalities) gave positive meaning to a past of having been injured at the present after returning to competition. This makes it possible for athletes to predict a positive future and maintains these positive sequences. In addition, those with this modality have their thoughts and behavior oriented toward the future, which could be the most adaptive modality for returning to sports. The numbers of subjects who fell into each category were as follows: 78 for the neutral chain modality, 29 for the positive chain modality, and 6 for the negative chain modality. The results...
of a χ² test showed significantly different numbers of subjects in each cluster (χ²=71.81, df=2, p=0.00).

Lastly, one-way ANOVA was conducted with the three modalities of the sequence of temporal perspectives (i.e., time perspective chain modalities) after returning to competition as independent variables, and the degree of the injury (i.e., the number of weeks the athlete stopped playing sports), degree of perceived psychological damage at the time of injury, DDF-S, perception of support, AIPA-S, ARD-S, perceptions of injury healing and recovery of performance for competition, and perception of personal growth as dependent variables. The results of this analysis are reported in Table 6.

As can be seen in Table 6, no significant difference was found among the modalities for the following variables: the degree of injury and degree of perceived psychological damage at the time of injury, the DDF, and the perception of support. On the other hand, significant differences were found among the modalities for variables including all the scales of AIPA and ARD, and perception of recovery of performance for competition and feeling of personal growth as dependent variables. The results of this analysis are reported in Table 6.

In this study, statistically significant correlations were found among DDF and the past, present, and future perspectives; however, no significant differences were found among the modalities of the sequence of temporal perspectives. Inconsistent results were not sufficient to question the original hypothesis. Therefore, as a supplemental analysis, additional correlation analyses were conducted between the DDF-S and AIPA-S. The results showed statistically significant negative correlations between the DDF-S and the subscales of the AIPA-S as follows: with the focus on the present, r=−0.34 (p<0.00); with self-motivation, r=−0.19 (p<0.05); and with the whole AIPA, r=−0.30 (p<0.01). Based on the results, partial correlations were calculated between the DDF-S and each perspective with the whole AIPA as the control variable. The results of partial correlations were as follows: with the past perspective, r=−0.07 (p>0.05); with the present perspective, r=−0.21 (p<0.05); and with the future perspective, r=−0.16 (p>0.05). The original correlation coefficient decreased significantly, and the correlations were not significant except for DDF-S and the present perspective.

Put simply, the level of DDF does not directly impact adaptation after returning to competition, but it has a mediation effect on adaptation through AIPA. In other words, the significant correlations between DDF and each perspective can be regarded as spurious correlation. However, a mediation variable, AIPA, does play a role in such significant correlations.

The above results can be summarized as follows.

First, the adaptive state after returning to competition can be understood from each modality (i.e., positive, neutral, and negative chains) of temporal perspective. The method of maintaining the temporal perspective for the

| Table 4. Descriptive statistics and results of ANOVA for three preoccupations with time (i.e., Dominance) related to the modality of the sequence of temporal perspectives |
|---------------------------------------------------------------|
| Psychometric properties | Time perspective chain modality | Mse | Multiple comparison |
|--------------------------|---------------------------------|-----|---------------------|
|                          | C-1 (n=29)                      |     |                     |
| Past dominance           | 4.41 (2.08)                     | 2.09|                     |
| Present dominance        | 3.66 (1.90)                     | 1.42|                     |
| Future dominance         | 5.17 (1.39)                     | 5.82| * 1>2,3             |
|                          | C-2 (n=78)                      |     |                     |
| Past dominance           | 4.12 (1.63)                     |     |                     |
| Present dominance        | 3.92 (1.40)                     |     |                     |
| Future dominance         | 4.53 (1.25)                     |     |                     |
|                          | C-3 (n=6)                       |     |                     |
| Past dominance           | 4.83 (1.60)                     |     |                     |
| Present dominance        | 4.33 (1.03)                     |     |                     |
| Future dominance         | 4.00 (1.00)                     |     |                     |

***p<0.001; **p<0.01

| Table 5. Characteristics of modalities of the sequence for temporal perspectives |
|---------------------------------|
| Positive sequence C-1 (n=29)   |
| Participants perceive past experiences of injury positively and find some positive meaning in their current life. They can predict a positive future and maintain internally integrated connections among the past, the present, and the future. They think about their future, have wishful thinking, and are in a quite adaptive state. |
| Neutral sequence C-2 (n=78)    |
| Participants perceive past experiences of injury positively and/or negatively; it can be considered that they are in a half-conflict condition. They have neither positive nor negative attitudes toward past experiences of injury. Their attitudes toward the past, the present, and the future can fluctuate based on the conditions that they are in and are not always consistent. They do not have internally integrated connections among the past, the present, and the future; they are in a conflict state. |
| Negative sequence C-3 (n=6)    |
| Participants perceive past experiences of injury negatively. They are in a troubled condition at the present, even after returning to competition. They can predict a negative future, and there are no internally integrated connections that are maintained among the past, the present, and the future, which are diffused. They give up hope or despair about their future. They are in a maladaptive state. |
positive modality of sequence (i.e., positive chain mode) is
to have a preoccupation with the future (i.e., future domi-
nance). Second, the largest number of injured athletes that
return to competition fell into the neutral sequence of mo-
dality (i.e., neutral chain mode) for the temporal perspec-
tive, whereas a few of them fell into the negative sequence
of modality (i.e., negative chain mode). Third, it was found
that the degree of injury and the degree of psychological
damage at the time of injury did not impact adaptation after
returning to competition. Fourth, the levels of AIPA and
ARD during the rehabilitation period defined the adap-
tive state after returning to competition. The rehabilitation
outcome levels with regard to recovery of performance for
competition and feeling personal growth at the point of re-
turning are also important factors for prediction of injured
athletes’ adaptation after returning to competition. Fifth,
DDF characteristics do not directly impact adaptation after
returning to competition. However, they may indirectly im-
 pact such adaptation through AIPA.

**DISCUSSION**

Most previous research has examined the short-term ef-
facts of using a direct approach, such as reducing injured
athletes’ psychological stress and negative emotions or en-
couraging positive changes in coping behaviors (e.g., reha-
bilitation). Therefore, it has been difficult to discuss injured
athletes’ adaptive states after returning to competition. Con-
sequently, the psychological interventions for injured
athletes proposed by previous studies have been rather lim-
ited. In this study, Katsumata’s temporal perspective FB-FF
theory was used to understand injured athletes’ adaptive
state after returning to competition. The injured athletes’
psychological and behavioral factors during the rehabilita-
tion period were examined, as they influence the temporal
perspective.

The correlation coefficients among subscales of the TP-S
suggested that three perspectives (i.e., the past after return-
ing to competition, the present, and the future) positively
influenced each other and maintained the impact of the ath-
lete’s perspective, and this was supported by the results of
cluster analyses (Table 3). Furthermore, significantly dif-
ferent numbers of subjects in each cluster were found in the
three modalities of the sequence (i.e., positive, neutral, and
negative chains), with the ratios being 25.66%, 69.03%, and
5.31%, respectively. The results indicated that only a quar-
ter of the subjects were in the adaptive and positive moda-
lity of the sequence (i.e., positive chain modality); therefore,
the athletes’ adaptive state after returning to competition
could not always be positive. Although further examination
is needed, those who are in the negative modality of the
sequence (i.e., negative chain modality) may include people
with psychopathological or clinical problems.

Next, examination of the present perspective, after re-
turning to competition, in attitudinal variables during re-
habilitation and rehabilitation outcome indices revealed
that those who demonstrated high levels of AIPA and ARD
during rehabilitation clearly perceived recovery of perfor-
ance. Moreover strong feelings about personal growth at
the point of returning were indicative of a better adaptive
state afterwards. Previous studies have already provided
evidence of the causal relationship between AIPA and

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**Table 6.** Descriptive statistics and results of ANOVA for individual differences factors, attitudinal indices for rehabilitation, and rehabilitation outcome indices for the modality of sequence

| Psychometric properties | Time perspective chain modality | | | | |
|-------------------------|--------------------------------|---|---|---|---|
|                         | Positive (n=29) | Neutral (n=78) | Negative (n=6) | Mse | Multiple comparison LSD method |
| Individual differences factors | | | | | |
| Degree of injury | 9.41 (12.70) | 7.68 (11.80) | 5.00 (4.10) | 59.97 | — |
| Psychological damage | 3.03 (1.55) | 3.01 (1.30) | 3.67 (1.75) | 1.20 | — |
| DDF-S | 3.24 (1.57) | 3.51 (1.30) | 4.50 (2.17) | 3.98 | — |
| *Perception of support including listening and acceptance | 2.38 (0.75) | 2.54 (0.53) | 2.83 (0.41) | 0.54 | — |
| Attitudinal indices for rehabilitation | | | | | |
| **AIPA-S** | | | | | |
| Self-motivation | 5.59 (1.50) | 4.73 (1.26) | 3.00 (1.55) | 18.68 *** | 1>2>3 |
| Focus on the present | 5.31 (1.76) | 4.53 (1.27) | 3.50 (1.64) | 10.87 ** | 1>2,3 |
| AIPA overall score | 5.41 (1.62) | 4.62 (1.05) | 3.17 (1.33) | 14.61 *** | 1>2>3 |
| **ARD-S** | | | | | |
| Rehabilitation participation | 6.10 (1.37) | 5.10 (1.66) | 4.67 (1.97) | 12.01 ** | 1>2,3 |
| Rehabilitation completion | 5.66 (1.26) | 4.76 (1.42) | 4.00 (1.90) | 11.38 *** | 1>2,3 |
| Rehabilitation effort | 6.17 (1.10) | 5.08 (1.37) | 4.67 (1.21) | 14.11 *** | 1>2,3 |
| Rehabilitation outcome indices | | | | | |
| Injury healing | 8.40 (1.57) | 7.63 (1.97) | 6.92 (2.42) | 86.43 | — |
| Recovery of performance for competition | 8.83 (1.26) | 7.47 (2.15) | 6.08 (3.85) | 282.71 *** | 1>2,3 |
| Feeling of personal growth | 5.90 (1.15) | 4.97 (1.03) | 3.50 (1.64) | 17.44 *** | 1>2>3 |

*Applies to this scale only (N=103)
and experience of mutuality under crisis conditions. Al-
coping effort (i.e., rehabilitation) for overcoming an injury,
include facing the injury event (i.e., crisis), devotion to the
growth, physical recovery, and adaptation after returning
lated. It is suggested that important factors for personal
perceived physical recovery or the perceived personal
habilitation condition are effective. By incorporating these
examine who is an effective support provider, what support
being listening and acceptance. Future research needs to
porating this perspective. On the other hand, the kinds of
therefore, it is urgent to establish a research model incor-
athlete’s worries and emotions is expected to be significant;
the support was effective. Moreover, multiple names were
received support and to describe the person who gave them
support. However, they were not asked to indicate whether
and adaptation after returning to competition.

The results of correlation analyses between the DDF-S
and AIPA-S, as well as those of partial correlation analyses
between the DDF-S and each of the temporal perspectives
with AIPA as the control variables leads to the hypothesis
that DDF characteristics of injured athletes indirectly influence
each perspective with the mediation effect of AIPA.
The results of correlation analysis between DDF and pre-
occupation with the past (i.e., the past dominance) demonstrat-
that injured athletes that had a higher level of DDF
characteristics tended to persist in the pre-injury self, which
was disconnected from the present self. This may lead to
difficulties in moving onto AIPA and the practice of posi-
tive rehabilitation behaviors. Therefore, examining the characteristics of personality such as DDF (e.g., emotional
communication and emotional expression) or variables de-
scribing individual differences (e.g., emotional competence
and emotional intelligence) are suggested to be effective
and to have meaning for interventions that support AIPA
and adaptation after returning to competition.

Lastly, the tasks for future studies are outlined next. This
study examined injured athletes’ perceptions of support in-
cluding listening and acceptance; however, no significant
correlation was found with adaptation after returning to
competition. The subjects were asked to indicate if they had received support and to describe the person who gave them
support. However, they were not asked to indicate whether
the support was effective. Moreover, multiple names were
often listed as support providers; therefore, it was difficult
to identify the effective support provider to incorporate the
information into the analysis in this study. The influence
of a support provider who listens to and accepts an injured
athlete’s worries and emotions is expected to be significant;
therefore, it is urgent to establish a research model incor-
porating this perspective. On the other hand, the kinds of
effective support can be expected to vary rather than just
being listening and acceptance. Future research needs to
examine who is an effective support provider, what support
is effective, and which stage in rehabilitation and what re-
habilitation condition are effective. By incorporating these
perspectives into a research model, the standpoint for psy-
chological intervention will be more concrete. In addition,
a supplemental test was conducted in this study; however,
it is necessary to fully examine the influence of personality characteristics related to emotional communication and
emotional expressions (e.g., DDF) and the variables de-
scribing individual differences (e.g., emotional competence
and emotional intelligence) on AIPA and ARD. Such in-
vestigations would lead to effective psychological support
that takes individual differences into consideration. Lastly,
limitations of this study are discussed. The adaptive state
of injured athletes after returning to competition does not
always remain fixed, and it can change gradually. However,
it was not possible to examine this topic in the analysis in
this study; therefore, future studies need to examine injured
athletes through longitudinal research.

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