Association between obligatory instrumental ties and competitive performance in DanceSport couples and mediation of athlete engagement: An actor–partner interdependence mediation model

Xiuxia Liu
Xiamen University

Yang Liu
Nanchang Normal University

Dandan Pan
Shanghai Elite Sport Training Administrative Center

Xinghe Weng
Xiamen University

Article

Keywords: actor-partner interdependence mediation model, partnership, obligatory instrumental ties, competitive performance, athlete engagement

Posted Date: February 7th, 2024

DOI: https://doi.org/10.21203/rs.3.rs-3873437/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License

Additional Declarations: No competing interests reported.
Abstract

Background: The obligatory instrumental ties between DanceSport couples has an important impact on the competitive performance (CP). The purpose of this research is to study the mechanism of the dyadic influence of the obligatory instrumental ties' influence on competitive performance.

Methods: The participants included 67 dyads of Chinese elite dancers aged 16 to 30 years. The Obligatory Instrumental Ties Questionnaire (QIT), the Athlete Engagement Questionnaire (AEQ), and the Competitive Performance Questionnaire (CPQ) is used to collect data on DanceSport couples. The structural equation model was employed in the dyadic analysis based on the actor-partner interdependence mediation model.

Results: Regarding the actor effects, male' (β=0.223, P=0.017) and female' (β=0.241, P=0.012) perceived obligatory instrumental ties quality was positively associated with competitive performance; the males’ AE partially mediated the effect of obligatory instrumental ties on competitive performance [indirect effect=0.147, SE=0.081, 95% confidence intervals (CI)=0.010,0.359]. The female’ athlete engagement mediated the effect of her perceived obligatory instrumental ties quality on her competitive performance [indirect effect=0.328, SE=0.328, 95% confidence intervals (CI)=0.072,0.513]. Regarding the partner effects, female’ athlete engagement partially mediated the effect of her perceived obligatory instrumental ties quality on male's competitive performance [indirect effect=0.315, SE=0.083, 95% confidence intervals (CI)=0.155,0.547].

Conclusions: The results of this study not only verify the views of the theory of self-determination, but more importantly provide evidence to enrich and improve the theory of self-determination to a certain extent, requiring that the theory of self-determination should fully consider the gender characteristics of individuals.

Background

The importance of effective talent development in sports is well established as a key aspect of achieving high-level performance\(^1\). Athletic ability is an important influencing factor to achieve high-level performance. Thus, how to improve athletic ability and performance become an endogenous motivation for competitive sports including DanceSport. The interpersonal relationship is ignored. However, it is presented at a psychology conference as an important influencing factor in competitive performance by Iso-Ahola (1995)\(^2\). Iso-Ahola (1995) proposes an interactionist model, which indicates that behavior or performance is a function of the interaction between person and environment \([B=f (P \times E)]\)\(^2\). Among these interpersonal factors, which are concerned with one’s social environment (such as social support network), is stressed by recent years’ research, especially in the coach-athlete relationship\(^3\) and athlete-athlete partnership\(^4\).
Dancesport partnerships are also in the spotlight. As a competitive sport, DanceSport required partners to follow the rhythm of the music and compete against couples of dancers to display the beauty of the sport. And partnering skills is one of the important judging points in World DanceSport Federation competitions. So, the analysis of various problems surrounding DanceSport must always consider the partnership between couples. Otherwise, belittling or ignoring partnership might be detrimental to performance (e.g., persistence, motivation, success). To be more specific, in the competition field, although judges scores based on the body control, posture, shape, footwork, timing, rhythm, and the level of difficulty of the routine, they observe all these components within a noticeably fleeting period, and with up to 50 couples on the floor in the early heats and judges eliminating 50% of the couples in 2 minutes (USABDA, 2006). Therefore, experienced competitors hold that it is not enough to execute technically correct steps, the dancers need to make it look effortless, graceful, and enjoyable, and harmony between the couple. Even though, as in other sports that combined aesthetic artistry with athletic ability, judging can lead to unexpected or unpopular results because of its subjective nature. In addition, as a kind of dance, interpersonal abilities are the engine of artistic communication, and partnership is the psychological projection of mutual adaptation of DanceSport partners and the basis of high-level cooperation between them. Thus, the effect of partnership on competitive performance has become an important hypothesis in related studies. The premise of showing a perfect image in the competition is to establish a stable and high-quality partnership.

What is a high-quality partnership? In all, a high-quality obligatory instrumental ties between DanceSport couples forms a high-quality partnership between the couples. In the Chinese context, a high-quality obligatory instrumental ties refers to the tendency of elite dancers to maintain high-quality reciprocal behaviors in their partnership based on the principle of obligation ruled by “renqing” during the whole process of aiming at DanceSport competitions, which contains a high level of sense of obligation and utilitarian factors. It is mostly determined by the purpose of competitive sports to expect to win the competition. As a competitive sport, excellent competitive performance is the capital for sports dancers, for they can be rewarded rich prizes, and international prestige. Otherwise, the dancers will be eliminated from DanceSport. As Cheng Dan, the champion of China’s ballroom dance professional group, recalled: “We did not want to be eliminated, and instead of the best players, we were more active in this field of competition.” So, partners often exhibit a high degree of reciprocity and interaction, and the partnership is always taken as an instrument to obtain benefits. When describing the ideal dance partnership, an elite dancer suggests a partner who can help them improve their dancing skills, and obtain excellent competitive performance is perfect. Although scholars have argued that there are a high level of expressive ties between DanceSport partners, especially for couples in elite dancers, obligatory instrumental ties can not be ignored. Because DanceSport is competition-oriented, and according to Sam Carr (2012), performance-oriented motivational climates inhibited positive friendship quality by creating a competitive sporting environment which encourages the perception that teammates are rivals and dampened the likelihood of intimacy and closeness in sporting relations. Therefore, even if there are expressive ties between the DanceSport couples, dancers would follow more the requirements
of the obligatory instrumental ties in the context of training and competition in DanceSport, and the
dancers might temporarily put aside the expressive ties between them.

Association between obligatory instrumental ties and competitive performance is supported by many
scholars, but how it happens and the difference between the males and females remains unclear.
Therefore, up to now, there are few theories to guide the management methods of partnership. So, to
address this problem, we draw useful experiences from the relevant theories of obligatory instrumental
ties. Firstly, we propose the mediating role of athlete engagement based on self-determination theory and
its related applied research. Secondly, considering that there are gender differences between dance
partners, and the cognitive, emotional, and behavioral aspects of the two are mutually influential, we
construct an actor-partner interdependence model of the effect of obligatory instrumental ties on
competitive performance based on the interdependence theory. In addition, the author of this study has
been involved in professional DanceSport training for seven years and has competition experience, she
has a deep sense and understanding of partnership between DanceSport couples, which is also extremely
valuable to complete this study.

Athlete Engagement Between Obligatory Instrumental Ties and Competitive Performance

Obligatory Instrumental Ties (OIT), refers to the reciprocal behavior tendency of elite dancer couples
based on the principle of obligation ruled by “renqing” to maintain their partnership in the entire process
of taking DanceSport competition as the goal, which contains obligation and instrument factors. As
mentioned above, it is determined by the purpose of competitive sports to expect to win the competition.
We aims at find the mediator between obligatory instrumental ties on competitive performance.

Under the Chinese context, individuals tend to “rely on each other”, and they would influence interpersonal
interaction intentionally or unintentionally. In addition to the view of the “S-O-R” model of dynamic
psychology, the current study believes that there is an organism that transformed stimulus into response
between the partnership of the DanceSports couples and competitive performance. Through the previous
literature, it is believed that the athlete engagement is an important mediator between partnership and
competitive performance. Along with the rise of positive psychology, Lonsdale C, Hodge K & Raedeke T D
engagement, which is a lasting, relatively stable movement experience and which is composed of
confidence, dedication, enthusiasm, and vigor. Athlete engagement is highly relevant to top elite athletes.
Confidence represents “the belief in one's ability to perform at a high level and achieve desired goals”;
dedication represents “the desire to devote energy and time to achieving goals that one considers
important”; vigor is defined as “a feeling of being physically and mentally active”; and enthusiasm is
characterized by “a feeling of excitement and high enjoyment”. Self-determination theory suggests
that a sense relatedness is highly significantly correlated with the athlete engagement. So, Wang's
research team propose that improving the coach-athlete relationship would increase the level of athlete
engagement, at the same time, the research team also construct a mediating model of the coach-
athlete relationship on satisfaction with competitive performance, in which athlete engagement is the
mediator. In addition, Judges focus on whether the couples are harmonious, energetic, and confident (which are the components of athlete engagement) in competition. Studies have pointed out that confidence is an important predictor of competitive performance. Ifrar et al. (2020) stresses that the better-performing dancers tend to be more diligent with a firm belief in their success, confident in attaining their goals, and more motivated.

**Mutual Influences between the DanceSport dyads and the application of the APIM**

The interpersonal relationship is dyadic, and the dyadic structure is the core of interpersonal relationship. This structure captures the basic attributes of interpersonal relationships: firstly, the parties involve in the two individuals are interdependent and their interdependence is considered when planning interactions and activities. Secondly, the dyads have a common future and share the same tasks. Therefore, elite performance in DanceSport is also based on the close partnerships and the way partners affect each other and depend on one another, then on their ability to develop and arouse strong interpersonal feelings and cognition. So according to Middelberg (2001), as a partner dancing, DanceSport couples would inspire each other’s feelings and behaviors. In addition, in terms with the commonality theory and the interdependent theory, DanceSport couples interact with each other. To be more specific, interpersonal similarity is motivated by the same way of constructing experiences (i.e., cognitive style), rather than being similar to each other out of shared experience. If two people have the same views and opinions, their behaviors would converge regardless of their previous experiences. So, as for DanceSport couples, approaching or achieving improves competitive ability or performance is the main intrinsic motivation and the only way for the dancers to be active in the field. Both parties would be more confident, enthusiastic, and dedicated to achieve this goal. Based on the interdependency theory, as highly interdependent partners, the psychology, and behavior of dancers affects themselves and their partners at the same time.

At the same time, previous studies have often attempted to analyze individual responses from each member, assuming that independent observations, not interdependent ones, thus posing a significant threat to the accuracy of the analysis, (e.g., 67 dyads in the current study could be analyzed as 134 individual cases, predicting each outcome variable through her predictor variables and the non-independent nature of the dyadic data. So, Kenny and his colleagues develops the Actor-Partner Interdependence Model (APIM). As a promising approach to addressing interdependence in dyadic research, the APIM allows researchers to distinguish between partner effects (i.e. the extent to which specified characteristics of the self are a function of specified characteristics of one’s partner in a given dyad) and actor effects (i.e. the extent to which specifies characteristics of the self are a function of specified characteristics of the self). Through this approach, many studies have begun to focus on the interactions between the dyadic couples. However, a systematic review concludes that performance as an outcome variable in interpersonal relationships is currently difficult to conduct in many fields, and that the sports and workplace fields provide an opportunity to conduct relevant research by providing a psychological environment that promotes performance at the level of the dyadic relationship.
Therefore, the current study attempts to construct and verify an actor-partner interdependence mediation model based on relevant literature.

**The current study: Development of theoretical framework and hypotheses**

A high quality of obligatory instrumental ties implies that the dancers recognize the significant contribution of the partners to their professional growth and goal attainment and that he or she have to comply with the training schedule agreed upon with the partners out of “renqing (face)”-saving\(^{14}\). In addition, repetitive interactions helps to promote reciprocity and mutual aid with others\(^{30}\), and after partners have trained together over time, they both would develop mutually beneficial behaviors that reinforce the willingness to comply with the training plan, thus regularizing training and promoting the achievement of the competitors’ training goals. So, to a considerable extent, the quality of obligatory instrumental ties between dance couples could predict competitive performance. However, this kind of association differed in sex. A research reveals that males and females in the same occupation and profession showes significant similarities in values and work motivation\(^{27}\), which is consistent with the idea that DanceSport is for both male and female partners. That is, both of them have the primary goal of achieving superior competitive performance. While there is the possibility of strong men and weak women when the latter tend to succeed, they believe in their ability to control their destiny and hold that “if they put their hearts and soul into it, they can do anything.”\(^{27}\). So, whether it is a male or a female, the higher the quality of the obligatory instrumental ties between the partners, the more it could promote the dancer’s competitive performance. That is, to play the actor or partner effect. The actor effect refers to the influence of the relationship actor on its cognition, emotion or behavior, and the partner effect refers to the influence of the relationship partner on the behavior, emotion, and cognition of the other party\(^{31}\). However, in the Chinese cultural tradition, people are less tolerant of the utilitarianism displayed by acquaintances, such as long-time classmates and friends, than in the West, even though this utilitarian orientation is regulated by moral obligation (like “renqing”) to the interpersonal relationship rather than utilitarianism as the goal. Therefore, sports dancers may also develop mental states or behaviors that is not conducive to cooperative training or competition in specific situations because of the utilitarianism that exists between dance couples. As one professional elite dancer mentions: "We are not a couple, we are fighting together for a common goal, but I still hope not to look too much utilitarian, we are all friends" \(^{14}\). So, a dancer’s obligatory instrumental ties may not play partner effects on the partners’ competitive performance.

Thus, we propose:

- **H1**: male’s perceived obligatory instrumental ties quality will influence his competitive performance.
- **H2**: female’s perceived obligatory instrumental ties quality will influence her competitive performance.

The hypothesis above forms the model as shown in Figure 1.
Based on the previous literature, we believe that athlete engagement (confidence, dedication, enthusiasm, and vigor) mediates the relationship between obligatory instrumental ties and competitive performance. And according to the interdependence theory, as highly interdependent dance couples, one's mental state and behavior not only affects themselves but also their partners. To be more specific, the judges score the partners based on their harmony, energy and confidence and the reciprocal endeavor is the premise of these factors and an important factor in partnership between elite DanceSport couples. At the same time, according to Middelberg (2001), the individual behavior of athletes can stimulate the behavior of dance partners. So, DanceSport is not a solo endeavor, the partners need not match dancers perfectly in ability (although this is a benefit), but he or she should be willing to practice often. In addition, the partnership between DanceSport couples, as a dyadic partnership, is highly goal-oriented, the ideal partnership depends on long-term investment and emphasizes a high sense of responsibility (e.g., reliability, discipline, due diligence).

The current study also believe this mediation effect mentioned above is influenced by gender. From the perspective of exercise physiology, female dancers need to possess a higher level of positive psychological traits to overcome psychological problems caused by physiological load, and the athlete engagement is a psychological trait required in athletes, especially among elite athletes. For example, a study simulating the competition situation of DanceSport find that, based on the characteristics of special holding technology, the ratio of heart rate variability (HR_{sim}/HR_{max}) and VO_{2}/maximal oxygen uptake (VO_{2hold}/VO_{2max}) of male dancers is significantly lower than that of female dancers (p<0.01). And it is pointed out that the oxygen consumption of female dancers is 78% (p<0.05) of that of males, and their heart rate would increase by 14% (p<0.05) while maintaining posture. So, female dancers bore a stronger physiological load that males. In addition, in Latin American Dance, female dancers have more frequency and greater amplitude in twisting, turning, and other movements compared to male dancers. Besides, amid swirls and turns, females ignore the discomfort of high-heeled shoes to express unbridled jubilation. So, to some extent, female dancers are required to complete the competition with a more confident, enthusiastic, and active high level of athlete engagement. The study believes that female dancers need to have stronger autonomy, regardless of whether their partners can help them achieve their expected goals, whether it is conducive to their technical level, and whether they can morally comply with the training plan agreed upon with their partner, female dancers need to demonstrate a high level of athlete engagement. The male partners will strive to promote the improvement of competitive performance with the higher athlete engagement of the female partners. In addition, according to the perspective of the actor-partner interdependence model, the influence of the relational actor on one's emotions, behavior, and cognition is called the actor effect, while the influence on the other's emotions, behavior, and cognition is called the partner effect.

Thus, we propose:

- H3: male’ athlete engagement will mediate the effect of his perceived obligatory instrumental ties quality on his competitive performance
• H4: female’ athlete engagement will mediate the effect of her perceived obligatory instrumental ties quality on her competitive performance.

• H5: female’ athlete engagement will mediate the effect of her perceived obligatory instrumental ties quality on male’s competitive performance.

The hypothesis above forms the model as shown in Figure 2.

Methods

participants

The sample consists of 134 participants (67 dyads) who participates in the 2019 Chinese DanceSports Championship (Beijing Station) which is the highest-level event of Chinese DanceSport competition, held at Ditan Gymnasium. Three experienced international-level DanceSport judges are invited to select the sample for this study based on their knowledge of the competitors’ competitive ability, and a sampling frame of 242 competitors is chosen, with the following criteria: a) having a regular partner at least for 3 years; b) Outstanding performance in the past. To further prevent athletic ability interference, a second round of screening is conducted and 134 participants (67 dyads) of comparable competitive level are further selected as the sample for this study.

By communicating with the participants and their coaches or friends in advance, gaining their trust and support, and distributing paper questionnaires to them immediately after the competition, as well as electronic questionnaires to those who are not comfortable filling out the questionnaires immediately after the competition (the venue is noisy and they are physically exhausted after the competition). To ensure the independence of each person's responses 2 researchers assisted with data collection. The average age of participants is 19.85 for males (SD=4.02) and 18.94 for females (SD=3.07). In addition, male dance partners believe that they have formed a good friendship with female dance partners (26), and the number of similar relatives (5) and lovers (17) is more than that of female dance partners (22,4,15). However, female dance partners believe that there are just more cooperative partnerships with dance partners (26) than male dance partners (19).

Participation was voluntary and confidential, and informed consent was obtained from all participants. Informed consent was obtained from all adults and the parents or teachers of all adolescents included in the study. The study protocol was approved by the Institutional Ethics Review Board of the Nanchang Normal University, and all research was carried out in accordance with relevant guidelines/ regulations.

Materials

Obligatory Instrumental Ties Quality

The Obligatory Instrumental Ties in the Partnership Scale-DanceSport Couples (PS-DSC) is adopted for the current research. The questionnaire consists of 5 items, namely “Cooperate with my partner will get
closer to my goal”, “Cooperate with my partner will make me grow professionally” “Cooperate with my partner will achieve my goal” “Cooperate with my partner promote my ability” and “I obligately follow the training plan agreed with my partner” and Cronbach’s α is 0.879. Confirmatory factor analysis (CFA) is conducted to examine the validity of the measurement. The fit indices were: \( \chi^2/df=1.002 \) AGFI=0.957 RFI=0.979 CFI=1.000 PNFI=0.398 RMSEA=0.004 SRMR=0.012.

**Athlete Engagement**

The athlete Engagement Questionnaire (AEQ)\(^1\)\(^9\) is adopted for our study. The good adaptability of the questionnaire among Chinese athletes has been verified\(^2\)\(^2\). The scale consists of 16 items, and Cronbach’s α is 0.943, and its four dimensions Cronbach’s α is 0.867, 0.884, 0.910, 0.841 respectively.

**Competitive Performance**

Competitive performance includes the satisfaction of it and competition outcomes, so the Competitive Performance Questionnaire is with 4 items in total. 1) Athlete Satisfaction Questionnaire (ASQ)\(^3\)\(^6\) is adopted. 2) the ranking, which is an ordinal variable, in the competition is the performance outcomes, so it is assigned to a 5-level Likert scale according to 5 international-level Dance Sport judges, and the results obtain after data processing of five levels of ordinal variables with continuous variables are not biased. The scale consists of 4 items, and Cronbach’s α is 0.702. Confirmatory factor analysis (CFA) is conducted to examine the validity of the measurement. The fit indices are: \( \chi^2/df=0.042, \) NFI=0.999, AGFI=0.998, PNFI=0.333, RMSEA=0.000, SRMR=0.005.

**Analysis Strategy**

SPSS 22.0 with Mplus 8.3 is adopted to process and analyze the data. Firstly, descriptive statistical analysis is used to calculate the mean, standard deviation, and correlation of all variables to obtain an overview of variable characteristics and variable relationships. Secondly, according to the process of the study by Davis, Louise, Jowett, Sophia, Lafrenière, Marc-André K(2013), the actor and partner interdependence model was applied to analyze the mutual effects of one's obligatory instrumental ties with their partner on one's competitive performance as well as that of one's partner\(^2\)\(^8\). This statistical method is applicable for the analysis of dyadic data; it has been widely used in intimate-relationship studies\(^3\)\(^7\). To be more specific, the actor effect refers to the influences of an individual's traits on one's outcome variables, whereas the partner effect refers to the influences of an individual's traits on his or her partner's outcome variables. In addition, before proceeding to the analysis of actor-partner effects, we will test the hypotheses model, using the following indicators: \( \chi^2, df, CFI, TLI, RMSEA, SRMR. \) When the CFI>0.9, TLI>0.9, RMSEA<0.08, SRMR<0.08, the model is acceptable.

**Results**
As is shown in Table 1, for both males and females, competitive performance is not only correlated with one's perceived obligatory instrumental ties quality, but also significantly correlates with their partners'. Moreover, the correlation coefficients for males' perceived obligatory instrumental ties quality and males' competitive performance ($r=0.293$, $p<0.05$). And the correlation coefficients for females' perceived obligatory instrumental ties quality and females' competitive performance ($r=0.243$, $p<0.05$). Both females' and males' athlete engagement scores are positively correlated with their obligatory instrumental ties.

Table 1. Mean, standard deviation, and the correlation matrix of each research variable

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.Obligatory Instrumental Ties (M)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.Athlete Engagement (M)</td>
<td></td>
<td>0.565***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.Competitive performance (M)</td>
<td></td>
<td></td>
<td>0.293*</td>
<td>0.440***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4.Obligatory Instrumental Ties (F)</td>
<td></td>
<td></td>
<td></td>
<td>0.425**</td>
<td>0.278*</td>
<td>0.100</td>
</tr>
<tr>
<td>5.Athlete Engagement (F)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.297*</td>
<td>0.281*</td>
</tr>
<tr>
<td>6.Competitive performance (F)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.082</td>
</tr>
</tbody>
</table>

Note: *, $P<0.05$; **, $P<0.01$;***, $P<0.001$; N=134 Couples; F: female; M: male.

Furthermore, APIM is used to analyze the mutual influence of obligatory instrumental ties quality and competitive performance through the level of athlete engagement’s moderating effect as mentioned. At first, to reduce covariance to better explain the intercept before establishing APIM, each independent variable needs to be centrally transformed by subtracting the score of obligatory instrumental ties and the athlete engagement from the overall sample mean of that variable (He et al., 2018). To verify the actor-partner effect of paired competitors’ obligatory instrumental ties on their or their partner's competitive performance, this study uses obligatory instrumental ties between the couples as the independent variable in Mplus and their competitive performance as the dependent variable for model testing. Figure 3 shows the mediating model. The fitting index of the model is perfect, and the fit indices are: $\chi^2=28.836$, df=5, CFI=1.000, TLI=1.205, RMSEA=0.000, SRMR=0.006.

As is show in Table 2, male's perceived obligatory instrumental ties quality ($\beta=0.223$, $P=0.017$) and the female's ($\beta=0.241$, $P=0.012$) will influence their competitive performance. So, the hypothesis H1, and H2 are supported by our study.

Table 2. Standardization path coefficient and hypothesis testing results of obligatory instrumental ties' impact on competitive performance
Effect | Path | β | t | P | Test results
--- | --- | --- | --- | --- | ---
Actor Effect | OIT (M)→CP (M) | 0.223 | 2.397 | 0.017 | H1: supported
Actor Effect | OIT (F)→CP(F) | 0.241 | 2.511 | 0.012 | H2: supported

*Note*: OIT: obligatory instrumental ties; CP: competitive performance; F: female; M: male.

Then, the athlete engagement is added as the mediator in the model, the mediating effect is analyzed using the Bootstrap method, and 5,000 Bootstrap runs are performed, and the mediating effect is significant if the 95% CI do not contain 0. The figure 4 shows the mediating model, the model is perfect and the fit indices are: $\chi^2=69.267$, df=14, CFI=1.000, TLI=1.231, RMSEA=0.000, SRMR=0.007.

Male’s ($\beta=0.548$, P<0.001) and female’s ($\beta=0.618$, P<0.001) perceived obligatory instrumental ties quality will influence their athlete engagement. Male’s athlete engagement ($\beta=0.269$, P=0.047) level will influence his competitive performance. And female’s engagement level will influence her competitive performance ($\beta=0.532$, P<0.001) and male’s competitive performance ($\beta=0.510$, P<0.001).

Table 3. Significance test results of bootstrap mediation effect of obligatory instrumental ties on competitive performance

<table>
<thead>
<tr>
<th>path</th>
<th>Effect Value</th>
<th>Bootstrap SE</th>
<th>95% Bootstrap CI</th>
<th>Test results</th>
</tr>
</thead>
<tbody>
<tr>
<td>OIT (M)→AE (M)→CP (M)</td>
<td>0.147</td>
<td>0.081</td>
<td>[0.010,0.359]</td>
<td>H3: supported</td>
</tr>
<tr>
<td>OIT (F)→AE (F)→CP (F)</td>
<td>0.328</td>
<td>0.112</td>
<td>[0.072,0.513]</td>
<td>H4: supported</td>
</tr>
<tr>
<td>OIT (F)→AE (F)→CP (M)</td>
<td>0.315</td>
<td>0.083</td>
<td>[0.155,0.547]</td>
<td>H5: supported</td>
</tr>
</tbody>
</table>

*Note*: OIT: obligatory instrumental ties; AE: athlete engagement; CP: competitive performance; F: female; M: male.

As is show in Table 3, regarding the actor effects, male’ athlete engagement will mediate the effect of his perceived obligatory instrumental ties quality on his competitive performance [indirect effect=0.147, SE=0.081, 95% confidence intervals (CI)=0.010,0.359]. Female’ athlete engagement will mediate the effect of her perceived obligatory instrumental ties quality on her competitive performance [indirect effect=0.328, SE=0.328, 95% confidence intervals (CI)=0.072,0.513]. Regarding the partner effects, female’ athlete engagement partially will mediate the effect of her perceived obligatory instrumental ties quality on male’s competitive performance [indirect effect=0.315, SE=0.083, 95% confidence intervals (CI)=0.155,0.547]. So, the hypotheses H3, H4, and H5 are supported by our study.

**Discussion**

Actor effect analysis. The results indicate that the male’s (H1) and the female’s (H2) perceived obligatory instrumental ties quality will affect their competitive performance. Our results are consistent with current
mainstream views, such as human relations management and hygiene-motivational factors, that is, high-quality interpersonal relationships improve work performance. What is more, these theories also mention that interpersonal relationships creates a good working atmosphere. According to hygiene-motivational factors, there are hygiene factors to promote the performance, especially interpersonal relationships which could be transformed into motivative factors under certain conditions, thus positively promoting work performance\(^\text{38}\). Therefore, the study also find that the athlete engagement is the certain conditions, and male's (H3) and female's (H4) athlete engagement partially will mediate respectively the effect of their perceived obligatory instrumental ties quality on their competitive performance. The results are also in line with the interdependence theory and the actor-partner interdependence model, that is, the partners interact in cognition and emotion. In addition, the results are also under the theory of self-determination. The sense of relatedness is people's internal needs, and its satisfaction would promote cooperation and the goal achievement. As DanceSport couples, their satisfaction with the partnerships would promote their athlete engagement and the improvement of competitive performance.

Actor effect analysis. Our results indicate that female's athlete engagement partially will mediate respectively the effect of female’s perceived obligatory instrumental ties quality on the males’ competitive performance (H5). This finding demonstrates that female's athlete engagement is an important mediator. When the females thought that cooperation with the partners would enable their professional and technical growth, achieve the competitive goal, and obligatory abide by the training plan agreed upon with the dance partners, they will have a lasting and relatively stable sports experience, such as her belief in her ability to achieve high-level performance, and a strong desire to invest energy and time to achieve the goal and other psychological experiences, that is to say, higher degree of athlete engagement will be generated. Therefore, due to the need for females to demonstrate more complex twisting techniques, especially the holding techniques of modern dance, they need to generate more athlete engagement to overcome the greater physiological load than male dancers, and females are more instrumental-oriented due to their anti-traditional characteristics\(^\text{27}\). According to Boarddale et al, females with high achievement traits might have a high self-evaluation, such as describing themselves as independent, confident, enthusiastic, expressive, and understanding. In a survey, success-oriented women have an unusually strong belief in their ability to control their destiny, they believe that “if you put your heart and soul into it, you can do anything” \(^\text{27}\). At the same time, due to the game between the strength requirements of professional technology and the inability to meet the requirements of professional technology due to the constraints of gender thinking, female dance partners need to have greater autonomy. Their strong athlete engagement could play a partner effect on the competitive performance of male dance partners, but the strong athlete engagement of male dance partners might not play a partner effect on the competitive performance of female dance partners.

Conclusion

The obligatory instrumental ties between DanceSport couples exerts actor or partner effects on competitive performance, in which athlete engagement plays a mediating role. To be more specific,
males’ and females’ perceived obligatory instrumental ties exerts the actor effect respectively, and significantly positively affect their own competitive performance. Through the mediating role of athlete engagement, the males’ and females’ obligatory instrumental ties exerts actor effects on their competitive performance. However, Males’ and females’ perceived obligatory instrumental ties will not exert the partner effect on their partners’ competitive performance. In addition, the mediating effect changes with the change of gender. Compared with males, females are faced with a more cruel competition status and the industry reality that if they do not advance, they will fall back. Once their perceived obligatory instrumental ties, namely purpose and sense of obligation, are satisfied, the athlete engagement will be stimulated, it means that females will be more enthusiastic, dedicated and confident, which will meet the emotional needs of males to a certain extent. To promote the males' competitive performance. Therefore, through the females' athlete engagement, the females' perceived obligatory instrumental ties will indirectly affect the males' competitive performance ($\beta=0.315$ SE$=0.083$ 95%CI$=0.155$, 0.547).

To some extent, the results of this study reflect the complex relationship between the obligatory instrumental ties between the DanceSport couples, athlete engagement and competitive performance. The obligatory instrumental ties of both male and female partners can affect their own competitive performance. In addition, female partners have stronger utilitarian inclination and sense of obligation, and have stronger athlete engagement, which not only improves their own competitive performance, but also improves the competitive performance of their male partners. Males and females need to pay attention to promoting their own and each other’s athlete engagement, males should be confident and open mind as far as possible to enhance the degree of athlete engagement of female partners, females should also take the initiative to improve self-confidence, enthusiasm and other elements of athlete engagement. In addition, the results of this study not only validate the self-determination theory, but more importantly expand the boundaries of the self-determination theory, and believe that the self-determination theory should fully consider gender.

**Strengths and Limitations**

The findings of the present study should be considered in light of 2 strengths and 2 limitations. The 2 strengths include: 1) fully giving full consideration to the utilitarian characteristics of the pursuit of victory in competitive sports and the cultural context of the partnership between the DanceSport couples, believing that the obligatory instrumental ties between DanceSport couples exerts vital impact on competitive performance, and at the same time, using an actor-partner interdependence mediation model for the first time to explore the impact mechanism of heterosexual partnerships on competitive performance, especially how male dancers and female dancers influence each others’ competitive performance through partnerships. Few previous studies have explored this mechanism, although the literature search in this study has expanded the scope to include studies of paired sports, such as the the coach-athlete relationship and athlete-athlete partnership, which are associated with competitive performance. These studies mainly focuses on descriptive summaries through observation, believing that paired relationships will affect competitive performance. 2) The research results further strengthen the right of the self-determination theory, and it also stretch the boundaries of the theory of self-
determination, requiring that the theory of self-determination should fully consider the gender characteristics of individuals.

Nonetheless, due to the preliminary nature of our study, 2 limitations should also be noted: 1) The sample is only composed of Chinese DanceSport couples. This hinders the international dissemination of the findings. In the future, researchers should expand the scope of sample selection and select as many sport dancers from different countries as possible. 2) The sample size needs to be further expanded. Although there are research on partnerships that have selected samples of less than 67 pairs. Like the Ben Jackson et al. (2011), which involves 58 pairs of participants[^39], and Habeeb et al. (2017) which involves 51 pairs of participants[^40]. It maybe still lead to statistical errors. Further expanding the sample size in future research is needed. However, due to the need to search competition results, it is difficult to increase the sample size to more than 240 pairs. Because there's no space for more sport dancers in a single competition. But in the future, it is still necessary to consider solve this problem, or maybe we can start with statistics.

**Future research directions**

Given the cultural nature of interpersonal relationships and the essential characteristic of the DanceSport, it is needed to fully consider the cultural background of the impact of dance partnerships on competitive performance, and explore the association between expressive ties and competitive performance using APIM. To be more specific, on the one hand, the study of interpersonal relationship needs to be explored under the culture background. And according to the epistemological strategy of cultural psychology, that is, “one mind, many meanings; disunity universalism[^41]”, the partnership between DanceSport couples have a cultural identity. On the other hand, DanceSport is a discipline based on romantic fantasy, which is about love and sex[^42], openly expresses emotions[^43], and shows the body among heterogenic partners and highlights the intimate relationship between them[^42], romance remains the essential core of DanceSport[^32], so it is important to further explore the expressive ties between the DanceSport couples on competitive performance[^14].

**Declarations**

**Competing interests**

The authors declare that they have no competing interests.

**Data availability statement**

The data of the present study can be available from the corresponding author via the reasonable request.

**References**


**Figures**

![Figure 1](image-url)

**Figure 1**

The actor-partner effect hypothetical model of athlete dyads’ obligatory instrumental ties on them and their partners’ competitive performance.
Figure 2

A mediated hypothesis model of the effect of obligatory instrumental ties between couples on competitive performance

Figure 3

The actor-partner effect model of athlete dyads' obligatory instrumental ties on competitive performance
Figure 4

The mediating model of the influence of obligatory instrumental ties on competitive performance