The Integrated Model of Sport Confidence: A Canonical Correlation and Meditational Analysis

Stefan Koehn, Alan J. Pearce, and Tony Morris

The main purpose of the study was to examine crucial parts of Vealey’s (2001) integrated framework hypothesizing that sport confidence is a mediating variable between sources of sport confidence (including achievement, self-regulation, and social climate) and athletes’ affect in competition. The sample consisted of 386 athletes, who completed the Sources of Sport Confidence Questionnaire, Trait Sport Confidence Inventory, and Dispositional Flow Scale-2. Canonical correlation analysis revealed a confidence-achievement dimension underlying flow. Bias-corrected bootstrap confidence intervals in AMOS 20.0 were used in examining mediation effects between source domains and dispositional flow. Results showed that sport confidence partially mediated the relationship between achievement and self-regulation domains and flow, whereas no significant mediation was found for social climate. On a subscale level, full mediation models emerged for achievement and flow dimensions of challenge–skills balance, clear goals, and concentration on the task at hand.

Keywords: sources of sport confidence, flow, mediation

Confidence is an essential element of successful performance and positive experiences in any sport training and competition contexts. Although sport and exercise psychologists have long been aware of the important role of confidence, the conceptual development has become more comprehensive and specific to sport confidence. Three major concepts of confidence have been put forward, including self-efficacy, competitive self-confidence, and sport confidence. Much of the research on confidence over the last decades has been conducted in conjunction with the Competitive State Anxiety Inventory-2 (Martens, Vealey, & Burton, 1990). In many instances the research focus was on the multidimensional anxiety construct, cognitive and somatic anxiety, and effects on performance and correlates, whereas self-confidence was more of a by-product than a thoroughly defined research aim. Conceptually, self-efficacy is one of the most strongly supported advancements to self-confidence in sport (Feltz, Short, & Sullivan, 2008). Self-efficacy is connected with specific skills in practice (Bandura, 1986). Perhaps the weakness of self-efficacy in sport is its specificity. Strictly, to apply self-efficacy with maximum effectiveness, self-efficacy must be measured separately for every component of each task, whereas sport confidence focuses predominantly on the global level of self-confidence (Koehn & Morris, 2011; Vealey, 2001). Little has been done to address the concept of sport confidence directly. The purpose of this study was to examine Vealey’s (2001) model of sport confidence and the proposed relationships between key variables of the integrative framework.

The sport confidence model has evolved through three distinct stages. The foundation of the original conceptual framework of sport confidence was spurred on by the insufficiencies of applying general psychological concepts in a sport context. Vealey (1986) developed a state-trait conceptualization of self-confidence in sport, which she termed sport confidence, and included a third variable, competitive orientation, in a carefully specified model that was tested in a number of studies. Extending this early approach, Vealey, Hayashi, Garner-Holman, and Giacobbi (1998) proposed sources of confidence that were hypothesized to influence the level of confidence, which in turn influences the performance outcome. The new conceptualization of sport confidence also proposed that confidence should be viewed as a single construct lying on a continuum that varies from trait- to statelike. Finally, Vealey (2001) developed an integrative model of sport confidence, which has undergone continual small adjustments (Vealey & Chase, 2008).

The core of the sport confidence model consists of three source domains (achievement, self-regulation,
capabilities in order to experience flow. Flow does not
Csikszentmihalyi (1975) advocated that activities, such
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athletes' experiences is important because some of these
results from diverse samples or across various studies.

Previous research has rarely examined the sport
confidence model directly, apart from the operational-
ization and validation process. Initial tests by Vealey
and her colleagues (1998) between the newly developed
Sources of Sport Confidence Questionnaire (SSCQ; Vealey et al., 1998) and sport confidence, measured by the
Trait Sport Confidence Inventory (TSCI; Vealey, 1986), showed that physical/mental preparation was the
only significant predictor of trait confidence. Also using
the SSCQ and TSCI, Wilson, Sullivan, Meyers, and
Feltz (2004) found two sources of confidence, physical/
mental preparation and demonstration of ability, to be
significant predictors of confidence. To test the second
main prediction of the sport confidence model, Vealey et al. (1998) examined the influence of sport confidence on
athletes' experiences. For the methodological approach,
Vealey and colleagues dichotomized the sample into
high- and low-confident athletes. The results confirmed
that higher confidence levels were associated with higher
state confidence, higher intrinsic motivation, and lower
cognitive and somatic anxiety. The results also indicated
direct relationships between sources of sport confidence
and athletes’ experiences that questioned the proposition
of sport confidence being a mediator between source
domains and affect.

In the sport confidence model, the examination of
athletes’ experiences is important because some of these
variables might be mediating the relationship between
confidence and performance. One of the main variables
that could be a potential mediator is flow. Flow in sport
has been defined as optimal experience in the task at
hand (Jackson & Csikszentmihalyi, 1999). Originally,
Csikszentmihalyi (1975) advocated that activities, such
as rock climbing, chess, or basketball, provide action
opportunities that need to be matched by personal action
capabilities in order to experience flow. Flow does not
emerge based on objective situational challenges and
personal skills but on individual perceptions; therefore,
subjective experiences of similar situations can vary
between flow, boredom, and anxiety. A central variable in
facilitating flow is confidence (Kimiecik & Stein, 1992).
Confidence is a person’s belief in his or her capability
in a specific sphere (Vealey, 1986). Flow is based on
the perception of a balance between challenges and skills,
which is likely to depend on a person’s confidence regard-
ing that domain. In addition, confidence appears to play a
key role in conjunction with other flow dimensions, such
as sense of control. Strong confidence allows competitive
athletes to frequently experience flow in high-challenge
situations (Jackson & Csikszentmihalyi, 1999).

Previous research found significant associations
between confidence and flow in sport (Koehn, Morris, &
Watt, 2013) and between flow and performance (Koehn
& Morris, 2012). The contextual framework for most
studies (e.g., Jackson, Kimiecik, Ford, & Marsh, 1998;
Koehn et al., 2013) was based in flow theory to inves-
tigate correlates of flow. Future research needs to move
beyond this approach and assess this relationship from
a different conceptual angle, because both confidence
and flow are important for athletic performances and
the development of interventions that aim to improve
athletes’ performance.

Although the direct relationship between confidence
and flow has been well established empirically, the associa-
tion between sources of confidence and flow, and a
potential mediating role of sport confidence, has been
addressed merely on a theoretical level (Vealey, 2001).
From a flow perspective, athletes who perceive a high
level of individual ability and mastery, reflecting aspects
of Vealey’s (2001) achievement domain, would be able to
experience flow more frequently. Some indirect evidence
for the relationship between sources of sport confidence
and flow can be found in the results of qualitative research
on flow. In a sample of elite athletes, Jackson (1995)
reported not only that confidence was a factor facilitating
flow but also that precompetitive plans and preparation,
as well as optimal physical preparation and readiness,
affected flow. These aspects conceptually reflect some
parts of Vealey’s (2001) self-regulation domain. The flow
model by Kimiecik and Stein (1992) specified that social
factors, including coach and teammate interactions, could
affect flow. Jackson (1995) provided some qualitative
evidence that positive team play and optimal environ-
mental conditions, such as positive social relationships
and positive feedback from the coach, were reported to
facilitate flow. This indicates a conceptual link between
flow and Vealey’s (2001) social climate domain. These
results have been generally confirmed with athletes from
individual and team sports (Russell, 2001). A common
characteristic of previous findings by Jackson (1995) and
Russell (2001) was that if these factors were perceived
as nonoptimal, athletes’ flow experience was either
disrupted or even prevented. In sum, flow appears to be
an important outcome variable for testing theoretical
contentions of the sport confidence framework.
Confidence in sport is a key variable when it comes to athletes’ performance and experience in sport. Vealey (2001) proposed a theoretical framework of sport confidence to provide a better understanding of the role of confidence in sport because it conceptualizes sources of sport confidence as antecedents of confidence levels, which have an impact on athletes’ affect, cognitions, behaviors, and in turn performance. The importance of examining the sport confidence model can be attributed to practical implications. Confidence in sport is a volatile and ephemeral state, and it is vital for athletes to feel confident in and remain confident throughout competitions. Previous research corroborated confidence as a main antecedent of flow in sport. Although the relationship between sources of confidence and confidence and flow has not been addressed empirically, several theoretical links indicate the conceptual importance of flow as a direct or indirect outcome of confidence and sources of confidence (Jackson, 1995; Russell, 2001). Furthermore, for the development of tailored interventions, it is crucial to examine the relationship between sources of confidence and confidence levels and pinpoint the most relevant sources that fuel athletes’ confidence and optimal experience in sport. On the basis of the literature review, we hypothesized a positive association between sport confidence and dispositional flow (H1) and a positive relationship between source domains and sport confidence (H2). The achievement domain should display a particularly strong association with sport confidence (Vealey, 2001). The three source domains should demonstrate a positive link with dispositional flow (H3). We also proposed a positive association between individual sources of sport confidence, sport confidence, and flow dimensions (H4). Finally, we assessed confidence as a mediator between sources of sport confidence and flow (H5).

Methods

Participants

The sample consisted of 386 athletes between 18 and 43 years of age (M = 20.69, SD = 3.17) from various sports. The majority of athletes were involved in football (n = 114), followed by rugby (n = 55), basketball (n = 46), swimming (n = 17), and hockey (n = 15). Athletes (females = 129, males = 257) had been participating in their sports for a mean of 10.14 years (SD = 20.69, M = 4.22) and competing for an average of 8.14 years (SD = 3.17).

Measures

Trait Sport Confidence Inventory (TSCI). The TSCI (Vealey, 1986) was developed to assess how confident athletes generally feel when they compete. Items on the inventory ask the participants to compare themselves to the “most confident athlete you know” (p. 244). A sample item of the TSCI reads, “Compare your confidence in your ability to be successful to the most confident athlete you know.” The inventory consists of 13 items, each using a 9-point Likert scale anchored by 1 (low) and 9 (high). Trait confidence scores are obtained by adding up scores for the 13 items. Vealey (1986) reported Cronbach’s alpha coefficient of .93 for the TSCI. Similar to Vealey and colleagues’ (1998) approach, in this study the TSCI was employed as an operationalization of sport confidence to examine the mediating effect between sources of sport confidence and dispositional flow.

Sources of Sport Confidence Questionnaire (SSCQ). The SSCQ (Vealey et al., 1998) examines athletes’ sources of confidence. The SSCQ consists of nine subscales (sample items with subscales in brackets; the stem for all items reads, “I usually gain self-confidence in my sport when I”—”. . . develop new skills and improve” (mastery), “. . . demonstrate that I am better than others” (demonstration of ability), “. . . keep my focus on the task” (physical and mental preparation), “. . . feel I look good” (physical self-presentation), “. . . am told that others believe in me and my abilities” (social support), “. . . know my coach is a good leader” (coach’s leadership), “. . . watch another athlete I admire perform successfully” (vicarious experience), “. . . like the environment where I am performing” (environmental comfort), and “. . . see the breaks are going my way” (situational favorableness), with 43 items overall. Participants responded on a 7-point Likert scale anchored by 1 (not at all important) and 7 (of highest importance). The internal consistency values, measured by Cronbach’s alpha, were beyond the .70 criterion for all subscales, except for the variable physical self-presentation. At that stage, only two items were loaded on the Physical Self-Presentation scale. Vealey and colleagues (1998) decided to keep the scale and add further items to increase reliability. In this study the SSCQ was used to operationalize the various source domains of confidence, namely achievement, self-regulation, and social climate (Vealey, 2001). To this effect, we used composite scores of the mastery and demonstration of ability subscales to operationalize achievement, physical and mental preparation and physical self-presentation to operationalize self-regulation, and the remaining subscales to operationalize social climate.

Dispositional Flow Scale-2 (DFS-2). The DFS-2 (Jackson & Eklund, 2002) assesses the frequency of flow and consists of three items representing nine subscales, each comprising four items assessing one of the nine dimensions of flow. Thus, the nine subscales represent the nine flow dimensions. Item examples of the nine subscales are reflected in “My abilities match the high challenge of the situation” (challenge–skills balance), “Things seem to happen automatically” (action–awareness merging), “I know clearly what I wanted to do” (clear goals), “I am aware of how well I am performing” (unambiguous feedback), “My attention is focused entirely on what I am doing” (concentration on the task at hand), “I have a sense of control over what I am doing” (sense of control), “I am not concerned with how others may be evaluating me” (loss of self-consciousness), “It feels
like time goes by quickly” (time transformation), and “I really enjoy the experience” (autotelic experience). The response format is a 5-point Likert scale anchored by 1 (never) and 5 (always), assessing respondents’ frequency of flow experiences. The subscales showed acceptable Cronbach’s alpha values ranging between .81 and .90 (Jackson & Eklund, 2002). In this study, the flow was included as a dependent variable to evaluate the outcome of the mediating effect of sport confidence between sources of sport confidence and affect, as measured by the DFS-2.

**Procedures**

Following approval from the university’s ethics committee, access was requested from club athletes and university students who were actively competing in their chosen sports. Information statements and consent forms were handed out. Participants who volunteered and provided informed consent completed the three questionnaires within 15 to 20 min at their home venues or at the end of a university lecture. All participants received oral and written information regarding the measures. First, the researcher explained to the participants what the questionnaires were about and how to complete them. Second, the researcher asked the participants to read the introductory section before moving on to the test items. Written instructions on completing the measure included an introductory part on top of each questionnaire. All responses were based on athletes’ general experiences in sport competitions. Finally, the researcher encouraged participants to ask questions both immediately after hearing and reading instructions and at any time during the session.

**Design and Statistical Analysis**

The study employed a correlational, cross-sectional design using sources of sport confidence as the independent variable, confidence as the mediating variable, and dispositional flow state as the dependent variable. The relationships among these variables were measured by the SSCQ, TSCI, and DFS-2. Data were entered into SPSS Version 20.0. Internal consistency was measured through Cronbach’s alpha for all subscales and global constructs. In addition, construct reliability for latent variables was calculated. Reliability was examined through the internal consistency of a set of measures, including source domains of achievement, self-regulation, and social climate, and through the variance extracted estimates, which indicate the total amount of variance in the indicators accounted for by the latent construct (Bollen, 1989). To calculate construct reliability, \( \rho \eta \), and the variance extracted estimate, \( \rho_{\text{ex}} \eta \), we used the formulae provided by Fornell and Larcker (1981). Lower acceptable values for reliability composites should be .70 (Yi & Davis, 2003).

We used Pearson’s product moment correlation coefficients to test H1 and linear multiple regression analysis for assessing H2 and H3. We employed canonical correlation analysis to test the relationship between sources of sport confidence, sport confidence, and flow on a subscale level (H4). Tabachnick and Fidell (2007) outlined the advantages of using two sets of multivariate variables because it provides a broader framework and fosters an understanding of the underlying dimensions in which the two sets of independent and dependent variables are associated.

Testing for indirect effects (H5) on a conceptual basis Baron and Kenny (1986) proposed that the following conditions need to be met to provide support for mediation effects. First, variations in the independent variable (IV) significantly account for changes in the mediating variable. Second, variations in the mediator significantly account for changes in the dependent variable (DV). Third, a formerly significant relationship between IV and DV is no longer significant. A number of studies have evaluated the best statistical approaches to assess mediation effects, including partial correlation, hierarchical regression models, and structural equation modeling (Cheung & Lau, 2008). It has been suggested that structural equation modeling (SEM) would be a superior analysis technique because it accounts for measurement errors (MacKinnon, 2008), whereas hierarchical regressions are affected by measurement errors and potentially underestimate the mediation effect (Kenny, Kashy, & Bolger, 1998). In addition, bootstrapping techniques are useful, particularly in small and moderate samples, when sample distributions have been violated (Cheung & Lau, 2008), and to define confidence intervals of the mediation effect (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). In this study we examined the mediation effect based on suggestions and procedures tested by Cheung and Lau (2008), which extends previous work by MacKinnon and colleagues (2002). Using SEM in AMOS 20.0, data were assessed in terms of direct and indirect effects in conjunction with bootstrap methods. Following Cheung and Lau’s (2008) propositions, we selected the bias-corrected bootstrap confidence interval with a 95% confidence level and 1,000 bootstrap samples. The BC bootstrap calculations produce more accurate confidence limits and greater power to detect mediation and suppression effects over other approaches, such as the bias-corrected and accelerated method (BCa; Cheung & Lau, 2008).

Using the one-dimensional TSCI, the mediating variable needs to be defined as a single-indicator latent variable. Hayduk and Littvay (2012) conceptually supported the use of single latent variables, emphasizing that single indicators provide more precision in latent theory testing. Before model testing, we specified the regression coefficient and measurement error variance in sport confidence as a single-indicator latent variable. Munck (1979) described the process for specifying single indicators by using the following formulae for the calculation of the regression coefficient, \( \lambda = SDV/\alpha \), and measurement error variance, \( MEV = SD^2 (1 - \alpha) \). The same formulae were used for testing potential mediation effects of sport confidence on flow.
Results

The SSCQ, TSCI, and DFS-2 were completed with no missing data. Initially, we assessed reliability, normality, and multicollinearity of the data, followed by hypothesis-testing analysis.

Reliability

MacKinnon (2008) advocated that mediation analysis should be preceded by reliability assessments. Our calculations were based on both internal consistency and construct reliability. Acceptable Cronbach alpha values higher than .70 were found for measures of SSCQ (.93), TSCI (.94), DFS-2 (.91), DFS-2 subscales (ranging from .73 to .83), and SSCQ subscales (varying between .77 and .93), except for environmental comfort (.68) and situational favorableness (.58). The main analyses, however, did not take place on a subscale but on a source-domain level. Cronbach alpha values for composite variables were sufficient for achievement (.84), self-regulation (.71), and social climate (.91). In addition, model-based reliability estimates showed acceptable construct reliabilities for achievement, $\rho_{\text{eta}} = .81$, self-regulation, $\rho_{\text{eta}} = .73$, and social climate, $\rho_{\text{eta}} = .91$. Lower acceptable values for reliability composites should be at least .70 (Yi & Davis, 2003). The variance extracted estimates varied between .25 (self-regulation), .32 (achievement), and .33 (social climate).

Normality

To examine the normality of the data, we assessed distributional properties including skewness and kurtosis. The univariate skewness of the items tested ranged from -1.20 to -0.01, and univariate kurtosis varied between 1.84 and -1.26. Based on West, Finch, and Curran’s (1995) cutoff values, all items indicated a normal distribution with skewness values fewer than 2 and kurtosis values under 7. Table 1 showed moderate to high mean scores for SSCQ subscales, with highest scores for physical and mental preparation and mastery. Moderate mean scores were also recorded for trait confidence and dispositional flow.

Multicollinearity

The collinearity diagnostics for the four confidence variables (achievement, self-regulation, social climate, and sport confidence) were acceptable. Variation inflation factor (VIF) scores were substantially below 10 (Hair, Black, Babin, & Anderson, 2010), ranging from 1.03 to 1.93, and tolerance values varied from .52 to .97. A second set of regression analyses was conducted to assess the multicollinearity among flow dimensions. The results for dispositional flow showed VIF scores between 1.13 and 2.35, and tolerance values between .43 and .88.

Sport Confidence and Flow (H1)

Small significant correlations were found between sources of confidence and sport confidence ($r = .15, p < .01$) and dispositional flow ($r = .24, p < .001$). With regard to H1, confidence and flow revealed a moderate positive relationship ($r = .54, p < .001$). On a subscale level, confidence showed significant, positive relationships with all flow dimensions. Moderate-to-strong association were found for challenge–skills balance ($r = .60, p < .001$), sense of control ($r = .46, p < .001$), and concentration on the task at hand ($r = .42, p < .001$).

Source Domains and Sport Confidence (H2)

Table 1 showed that out of the nine sources of sport confidence subscales, only demonstration of ability, physical and mental preparation, vicarious experience, and environmental comfort were significantly correlated with sport confidence. The three source domains of achievement, self-regulation, and social climate accounted for 3% of the variance in sport confidence, $F(3, 382) = 3.68, p < .05$. The only significant predictor of confidence was achievement, $b = .15, p < .05$.

Source Domains, Sport Confidence, and Flow—Global Assessments (H3)

First, we assessed the source domains as predictors of flow in competition. The findings showed that the source domains explained 5% of the variance in flow, $F(3, 382) = 7.06, p < .001$. The achievement domain significantly predicted dispositional flow, $b = .14, p < .05$. Including sport confidence in the linear regression equation, the results showed that the four predictors accounted for 32% of the variance in dispositional flow, $F(4, 381) = 43.98, p < .001$. Sport confidence was the only significant predictor of flow, $\beta = .52, p < .001$.

Source Domains, Sport Confidence, and Flow—Subscale Assessments (H4)

To examine the multivariate relationship between sources of sport confidence and flow in more detail, we employed canonical correlation analysis through SPSS MANOVA syntax. This multivariate analysis technique allows for the examination between several independent (confidence sources) and multiple dependent variables (flow dimensions) that lower the possibility of committing a Type 1 error through the reduction of the number of statistical tests on the same variable (Hair et al., 2010). The canonical correlation analysis incorporates four predictor variables and nine criterion variables. The participant-to-variable ratio is 30:1, which has been supported as acceptable (Tabachnick & Fidell, 2007). The use of canonical correlation analysis is similar to the one previously applied by Jackson and colleagues (1998) and Koehn and colleagues (2013) examining flow in sports.

The results showed one significant canonical variate. In the dimension reduction analysis the first out of four roots was statistically significant, explaining more than 10% of the variance. For the following analysis, only the dimensionalities of the first root are being taken into...
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<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mastery</td>
<td>.18**</td>
<td>(.87)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td>Demonstration of ability</td>
<td>.52**</td>
<td>.22**</td>
<td>(.77)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td>Physical and mental preparation</td>
<td>.35**</td>
<td>.22**</td>
<td>.43**</td>
<td>.27**</td>
<td>(.87)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>Physical self-representation</td>
<td>.30**</td>
<td>.37**</td>
<td>.10*</td>
<td>(.82)</td>
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<tr>
<td>5</td>
<td>Social support</td>
<td>.40**</td>
<td>.14**</td>
<td>.48**</td>
<td>.25**</td>
<td>.56**</td>
<td>(.93)</td>
<td></td>
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<td>6</td>
<td>Vicarious experience</td>
<td>.37**</td>
<td>.26**</td>
<td>.45**</td>
<td>.33**</td>
<td>.49**</td>
<td>.41**</td>
<td>(.86)</td>
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<tr>
<td>7</td>
<td>Coach’s leadership</td>
<td>.32**</td>
<td>.29**</td>
<td>.34**</td>
<td>.40**</td>
<td>.34**</td>
<td>.33**</td>
<td>.36**</td>
<td>(.68)</td>
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<td>8</td>
<td>Environmental comfort</td>
<td>.26**</td>
<td>.40**</td>
<td>.22**</td>
<td>.47**</td>
<td>.33**</td>
<td>.27**</td>
<td>.37**</td>
<td>.46**</td>
<td>(.58)</td>
<td></td>
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<tr>
<td>9</td>
<td>Situational favorableness</td>
<td>.08</td>
<td>.17**</td>
<td>.17**</td>
<td>.03</td>
<td>.06</td>
<td>.11*</td>
<td>.06</td>
<td>.11*</td>
<td>.07</td>
<td>(.94)</td>
</tr>
<tr>
<td>10</td>
<td>TSCI</td>
<td>.16**</td>
<td>.16**</td>
<td>.33**</td>
<td>.00</td>
<td>.11*</td>
<td>.21**</td>
<td>.14**</td>
<td>.17**</td>
<td>.06</td>
<td>.54**</td>
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<td>11</td>
<td>DFS-2</td>
<td>5.41</td>
<td>5.15</td>
<td>5.44</td>
<td>4.02</td>
<td>5.53</td>
<td>5.15</td>
<td>4.81</td>
<td>4.72</td>
<td>4.22</td>
<td>5.81</td>
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</table>

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

Note: Cronbach's Alpha and Correlation Coefficients.
consideration and subsequently used for interpretation. A significant relationship between the predictor and criterion sets emerged, Wilks’s Lambda = .53, $F(36, 1399) = 7.01, p < .001$. The squared canonical correlation for the canonical variate was $R^2 = .41$. The redundancy index ($r^2$), similar to $R^2$ in regression analysis, varied between 12% ($r^2_{predictor set} = .12$) and 16% ($r^2_{criterion set} = .16$).

Tabachnick and Fidell (2007) proposed that loadings needed to be over the .30 level, which accounts for about 10% of the variance, to provide the basis for meaningful interpretation. In the predictor set, sport confidence revealed a strong loading of .98. A smaller, interpretable loading was also found for achievement (.33). On the basis of these findings, this dimension is termed confidence due to its exceptionally high contributions by sport confidence. In Table 2, the criterion set of the canonical variate revealed strongest loadings for challenge–skill balance (.96), sense of control (.74), concentration on the task (.65), clear goals (.62), autotelic experience (.55), action awareness merging (.55), loss of self-consciousness (.47), and unambiguous feedback (.46).

Table 2  Results of the Canonical Correlation Analyses Between Flow and Its Predictors

<table>
<thead>
<tr>
<th>Variables</th>
<th>Canonical Correlation Loadings</th>
</tr>
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<tbody>
<tr>
<td><strong>Criterion Set</strong></td>
<td></td>
</tr>
<tr>
<td>Challenge–skill balance</td>
<td>.96</td>
</tr>
<tr>
<td>Sense of control</td>
<td>.74</td>
</tr>
<tr>
<td>Concentration on the task at hand</td>
<td>.65</td>
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<tr>
<td>Clear goals</td>
<td>.62</td>
</tr>
<tr>
<td>Autotelic experience</td>
<td>.55</td>
</tr>
<tr>
<td>Action–awareness merging</td>
<td>.55</td>
</tr>
<tr>
<td>Loss of self-consciousness</td>
<td>.47</td>
</tr>
<tr>
<td>Unambiguous feedback</td>
<td>.46</td>
</tr>
<tr>
<td>Time transformation</td>
<td>.20</td>
</tr>
<tr>
<td>Percent of variance</td>
<td>.37</td>
</tr>
<tr>
<td>Redundancy</td>
<td>.16</td>
</tr>
<tr>
<td><strong>Predictor Set</strong></td>
<td></td>
</tr>
<tr>
<td>Achievement</td>
<td>.33</td>
</tr>
<tr>
<td>Self-regulation</td>
<td>.19</td>
</tr>
<tr>
<td>Social climate</td>
<td>.23</td>
</tr>
<tr>
<td>Sport confidence</td>
<td>.98</td>
</tr>
<tr>
<td>Percent of variance</td>
<td>.29</td>
</tr>
<tr>
<td>Redundancy</td>
<td>.12</td>
</tr>
<tr>
<td>Canonical correlation</td>
<td>.64</td>
</tr>
<tr>
<td>Squared correlation</td>
<td>.41</td>
</tr>
<tr>
<td>$p &lt;$</td>
<td>.001</td>
</tr>
</tbody>
</table>

Sport Confidence as a Mediating Variable (H5)

The mediating effect of sport confidence on flow was assessed on a global and a subscale level (Table 3). On a global level, composite scores for source domains and dispositional flow were used to maintain a favorable participant-to-variable ratio, whereas on a subscale level item scores for source domains and flow dimensions were incorporated. For the single-indicator latent variable of sport confidence, the specifications for TSCI based on Munck’s (1979) formulae were 1.24 for the regression coefficient and .09 for the measurement error. These specifications were used for testing the standardized indirect effects of the mediating variable TSCI on flow. The results, based on procedures for bias-corrected confidence intervals for indirect effects (Cheung & Lau, 2008), showed that sport confidence partially mediated the relationship between achievement (lower bounds = .056; upper bounds = .304; $p = .014$) and self-regulation (lower bounds = .065; upper bounds = .281; $p = .018$) with dispositional flow. There was no significant mediation effect between social climate and flow. The direct effect of the source domains on flow without the mediator was moderate to strong ($\beta_{achievement} = .40$; $\beta_{self-regulation} = .55$). Calculations including sport confidence as a mediating variable showed that the strength of the direct effect of the source domains was reduced to a low or moderate level ($\beta_{achievement} = .22$; $\beta_{self-regulation} = .39$).

Using flow dimensions as dependent variables, sport confidence partially mediated the relationship between self-regulation and eight of the flow subscales, the exception being time transformation. Similarly, sport confidence was a partial mediator between social climate and unambiguous feedback and loss of self-consciousness. Finally, a full mediation model emerged indicating that sport confidence mediated the relationship between achievement and challenge–skills balance, clear goals, and concentration on the task at hand (Table 3).

Discussion

Confidence is a key element in the pattern of factors that affect involvement in sport, successful performance, and, most importantly, enjoyment of the sport experience. The purpose of this study was to test several aspects of Vealey’s (2001) sport confidence model, a theoretically driven view of self-confidence in sport. Given that confidence is recognized today to be one of the most important and ubiquitous factors in enjoyment and success in sport, the results provided additional support to this notion indicating a moderate-to-strong link between confidence and dispositional flow (H1). One of the main links in Vealey’s framework is the relationship between...
<table>
<thead>
<tr>
<th>Source Domains</th>
<th>Achievement</th>
<th>Self-Regulation</th>
<th>Social Climate</th>
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<tr>
<td>CSB</td>
<td>.23**</td>
<td>.10</td>
<td>.19**</td>
</tr>
<tr>
<td>AAM</td>
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<td>.029 .126 .003</td>
<td>.12 .08</td>
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<tr>
<td>CG</td>
<td>.21** .12</td>
<td>.033 .133 .002</td>
<td>.13** .08</td>
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<td>UF</td>
<td>.24** .20**</td>
<td>.012 .089 .002</td>
<td>.17** .14*</td>
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<tr>
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<td>.002 .054 .034</td>
<td>.15* 14*</td>
</tr>
<tr>
<td>AE</td>
<td>.04 .04</td>
<td>.029 .131 .004</td>
<td>.17** 13*</td>
</tr>
</tbody>
</table>

**Note.** ns = not significant. Bootstrap, BC, 95% confidence interval with 1,000 bootstrap samples. $\beta_{w/o M}$ = regression weight without mediator; $\beta_{w M}$ = regression weight with mediator. LB = lower bounds; UB = upper bounds reflect standardized scores of 95% confidence interval. CSB = challenge–skills balance; AAM = action–awareness merging; CG = clear goals; UF = unambiguous feedback; CTH = concentration on the task at hand; SC = sense of control; LSC = loss of self-consciousness; TT = time transformation; AE = autotelic experience.

*p < .05; **p < .01.
sources of sport confidence and confidence level. The results showed a clear positive association between both factors (H2), although only the achievement domain was a significant predictor of confidence.

Surprisingly, the three source domains of achievement, self-regulation, and social climate explained only a small portion of variance in flow (5%); including sport confidence in the equation increases the amount of variance explained in flow to 32%. Achievement was the only significant predictor of dispositional flow, providing partial support for H3. The relationship between source domains and flow appears more complex on a subscale level, and sport confidence should be taken into consideration when interpreting these associations. The results of H4 revealed different dimensions of discrimination of flow experiences. The first dimension showed a strong loading of sport confidence (.98) in the predictor set, and a smaller but significant contribution of achievement (.33), which suggests a confidence–achievement dimension. This supports previous results that have shown a substantial positive relationship between confidence and flow (Jackson et al., 1998; Koehn et al., 2013). The results of the canonical correlation analysis support the main hypothesis that sport confidence has a positive mediating effect on the source domain of achievement.

One of the main findings of this study was that confidence functioned as a mediator between sources of sport confidence and flow (H5). The results showed partial mediation between achievement and self-regulation domains and flow. On the basis of Baron and Kenny’s (1986) propositions, all conditions were met that represent a full mediation model explaining the relationship between achievement and challenge–skills balance, clear goals, and concentration on the task, although it was not the strongest demonstration of mediation, because the association between independent and dependent variables was not close to zero. In that case, the findings would indicate a single mediator (Baron & Kenny, 1986), whereas the current results suggested that there might have been multiple mediators. Vealey and Chase (2008) proposed that not only sources of sport confidence but also confidence itself should be viewed as a multidimensional construct that consists of confidence in one’s cognitive efficiency, resilience, and physical skills and training. Future research needs to address whether these three types of confidence represent potential mediating variables. It can be concluded that the findings fit the theoretical model quite well. The positive nature of the relationships between sources of sport confidence and sport confidence and between sport confidence and flow have been confirmed. In addition, confidence is central to these relationships, indicating a mediating effect between sources of confidence and positive experience.

In both conceptual frameworks of sport confidence (Vealey, 2001) and flow (Kimiecik & Stein, 1992), the authors proposed interaction effects that result in optimal experience. Interestingly, the interaction between confidence and social factors (e.g., team and coach’s behavior) and flow, as suggested by Kimiecik and Stein (1992), was not confirmed in the measurement context of the sport confidence model. This discrepancy could be due less to conceptual than to operational shortcomings. Recent flow research indicated that flow needs to be assessed not only on an individual level, as measured through the DFS-2 or the parallel flow state version (Jackson & Eklund, 2002), but more specifically at a team level (Bakker, Oerlemans, Demerouti, Bruins Slot, & Karamat Ali, 2011). Team interactions could provide a catalyst function that allows teammates to experience flow (Swann, Keegan, Piggott, & Crust, 2012). The fact that a large proportion of the current sample competed in team events could have minimized the mediation effect, as reflected in the results for social climate. Nonetheless, flow appears to be a key variable in the sport confidence framework because achievement and self-regulation domains showed a number of direct and indirect effects on dispositional flow dimensions. In particular, results for the self-regulation domain with its underlying component of physical and mental preparation indicated that flow should not be conceptualized as an impending outcome but as a psychological process that varies in accordance with athletes’ physical and mental match preparation.

Limitations of this study are related to the main measure, the design, and the recruited sample. First, one limitation that requires future attention is the psychometric quality of the SSCQ. In its final validation phase, Vealey and colleagues (1998) conducted a confirmatory factor analysis that supported the factor structure but also indicated room for improvement. A follow-up study by Wilson et al. (2004) revealed that eight subscales instead of the original nine-factor structure might be preferable. It should be mentioned, though, that the results of both studies lost some impact due to relatively small sample sizes, N = 208 and N = 216, respectively, in conjunction with 118 SSCQ estimates, and the use of rather young (15–18 years, Vealey et al., 1998) or mature (50–96 years, Wilson et al., 2004) age groups. In this study, we tried to circumvent some of these issues by the use of a moderate age group. We largely avoided tests on a subscale level and addressed the latent constructs of the confidence framework directly, despite the lack of previous psychometric assessment. Although there are methodological strengths of employing a theoretically driven approach, future research in this area should be dedicated to providing more rigorous psychometric evidence for the SSCQ. It is imperative to apply sound measures that accurately operationalize conceptual considerations.

Second, the use of a cross-sectional, retrospective design provided information on the correlational relationships of data; it does not allow drawing conclusions on the directional, bidirectional, or causal relationships between variables. This is a relevant point because Vealey’s (2001) confidence framework postulated reciprocal links between the main variables. Although evidence has been found in support of the sport confidence model, it needs to be acknowledged that there are limits to the interpretation of the findings. Future studies need to move beyond the assessments at one point in time, which restricts the
importance of confidence to athletes and the need for theory-based research. On the basis of the recognized sport confidence deserves to fare better, given the need for a more comprehensive and integrated conception of sport (Martens, Burton, Vealey, Bump, & Smith, 1983). The original sport confidence model attracted relatively little research, despite its roots in multidimensional anxiety in sport. The results of this study are encouraging because they provide support for theoretical contentions that sources of sport confidence and the level of confidence affect the way athletes perceive their competition experiences. In addition to flow, future research needs to provide more evidence of variables that constitute the ABC triangle, because these constructs influence performance most directly. These findings are relevant in the context of competitive athletes and with potential practical implications on how to enhance their confidence as developing athletes. Previous research has shown that confidence levels are higher in elite athletes in comparison with nonelite athletes (Kitsantas & Zimmermann, 2002). The results of this study could guide the development of interventions to improve experience and performance of nonelite athletes. Using imagery in tailored interventions that aim to enhance both confidence and flow would be a powerful approach to increasing performance. The inclusion of relevant sources of sport confidence, such as achievement, could positively contribute to the intervention outcome. For coaches and practitioners there are relevant implications when working with developing athletes to identify individually relevant sources of confidence to enhance confidence over time.

In summary, the main findings showed a positive relationship between sources of sport confidence with confidence levels and between confidence and dispositional flow. Interestingly, the relationship between source domains and flow was not significant, but we found confidence to be a mediator between sources of sport confidence and flow experiences. Vealey’s (1986) original sport confidence model attracted relatively little research, despite its roots in multidimensional anxiety in sport (Martens, Burton, Vealey, Bump, & Smith, 1983). The more comprehensive and integrated conception of sport confidence deserves to fare better, given the need for theory-based research. On the basis of the recognized importance of confidence to athletes and the need for theory on central variables like sport confidence to be developed and examined in sport psychology (Martens, 1987), it is hoped that more researchers will study the sources of sport confidence and their links to optimal experience and performance in competition.

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References


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