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**Abstract**

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**Keywords**

coach, measure, soccer, inventory, youth, leadership, transformational, differentiated, validation

**Disciplines**

Arts and Humanities | Life Sciences | Medicine and Health Sciences | Social and Behavioral Sciences

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# Validation of the Differentiated Transformational Leadership Inventory as a Measure of Coach Leadership in Youth Soccer

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This paper describes the validation of The Differentiated Transformational Leadership Inventory (DTLI) within a participation youth sports context. Three hundred and twenty-two athletes aged between 11 and 18 years completed the DTLI. Using a confirmatory factor analysis, the DTLI yielded an underlying factor structure that fell short of cut-off criteria for adjudging model fit. Subsequent theory-driven changes were made to the DTLI by removing the 'high performance expectations' subscale. Further data-driven changes were also made on the basis of high item-factor cross-loadings. The revised version of the DTLI was subjected to confirmatory factor analysis and proved to be a good fit for the obtained data. Consequently, a Differentiated Transformational Leadership Inventory for Youth Sport has been suggested for use within the participation youth sport context that contains 22 items, and retains six subscales.

Several lines of research have developed over recent decades that articulate the influential role that coaches have in facilitating important physical and psychological outcomes for athletes of all ages and competition levels. Further, several valid and reliable measures of coaching behavior have been derived from these lines of research. For example, the work of Côté and colleagues in developing the coaching model (Côté, Salmela, Trudel, Baria, & Russell, 1995) has resulted in the Coaching Behavior Scale for Sport (Côté, Yardley, Hay, Sedgwick, & Baker, 1999). Despite this, some coaches who practice in a youth sports context continue to measure their coaching effectiveness by outright success (Jones & Wallace, 2005). This is problematic given that outcomes such as positive psychosocial and moral development are argued to be of greater importance within a participation youth sport context (Côté, Bruner, Erickson, Strachan & Fraser-Thomas, 2010) to coaches (Vella, Oades & Crowe, 2011), researchers (Weiss, 2008), and policy makers (Fraser-Thomas, Côté & Deakin, 2005).

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Incorporating validated measures as indicators of coaching effectiveness is aided by the availability of such measures in the literature. Of particular note are the Leadership Scale for Sports (LSS; Chelladurai & Saleh, 1980), Coaching Behavior Questionnaire (CBQ; Kenow & Williams, 1992; Williams et al., 2003), Coaching Behavior Scale for Sport (CBS-S; Côté et al., 1999), and Coaching Behavior Assessment System (CBAS; Smith, Smoll, & Hunt, 1977). Perhaps the most commonly used measure of coaching behavior is the LSS (Chelladurai & Saleh, 1980). The LSS samples coaching behaviors over five subscales. The coach's decision-making style is measured using democratic and autocratic behavior subscales, and the coach's motivational behaviors are measured using the subscales of social support behavior and rewarding behavior. The LSS also incorporates a coach's training and instructional behaviors in a stand-alone subscale. The LSS has three versions that are used for coach self-assessment, athlete assessment of coaching behaviors, and athlete preferences for coaching behaviors. However, the autocratic behavior subscale of the LSS has suffered from some reliability and validity concerns which has led some researchers to modify the measure (Zhang, Jensen, & Mann, 1997). Further, due to the demands of the LSS it has mostly been used in a training context (Côté, 1998), leading researchers to suggest that it be complimented by the CBQ (Kenow & Williams, 1992; Williams et al., 2003) as this measure is used in competition settings (Mallett & Côté, 2006). The CBQ contains two subscales; Negative Activation includes a range of negative athlete outcomes to coaching behaviors including playing poorly, distraction and being uptight, and Supportiveness/Emotional Composure which includes positive, composed and supportive coach behaviors.

Alternatively, researchers have advocated the use of the CBS-S (Côté et al., 1999) within high performance contexts as it incorporates elements that are important to high performance coaching (Mallett & Côté, 2006). Athletes provide data on their perceptions of coaching behaviors over seven key areas; physical training and planning, goal setting, mental preparation, technical skills, personal rapport, negative personal rapport, and competition strategies. Unlike the measures reported above, the CBS-S is not derived from a prescriptive theory of coaching, but rather, is derived from the descriptive Coaching Model (Côté et al., 1995) which explains what it is that expert coaches do. The authors argue this to be one key advantage of the CBS-S (Mallett & Côté, 2006), however, its development in high performance contexts is problematic for youth sports coaches due to qualitative differences between high performance coaching and participation youth sport contexts (Côté & Gilbert, 2009). Lastly, researchers have advocated the use of an observer-rated measure of coaching behavior. The CBAS (Smith et al., 1977) has been used to rate coaching behaviors over 12 core areas including reinforcement and punishment, encouragement and technical instruction, poor or harsh technical instruction, and communication. This method has the benefits of objectivity in measurement of coaching behaviors. However, athlete perceptions and evaluative reactions of coach behaviors are critical in establishing their effectiveness. Consequently, the CBAS can be criticized as unable to incorporate constructs that are fundamental to coaching practice such as the quality of the coach-athlete relationship (Vella, Oades, & Crowe, 2010).

More recently, promising results have been obtained when applying the transformational leadership model (Bass, 1985) to sports coaching. Charbonneau, Barling and Kelloway (2001) first introduced this model as indirectly linked to the

sporting performance of University athletes, hypothesizing intrinsic motivation as a mediating variable. The logical conclusion is that a coach's transformational leadership behavior increases intrinsic motivation which in turn leads to increased sporting performance. Rowold (2006) confirmed and extended these results by demonstrating that transformational leadership behavior is also directly linked to an athlete's effort at training and frequency of training, as well as satisfaction with the coach and perception of the coach's effectiveness. Further, Arthur and colleagues have demonstrated that transformational leadership behaviors are linked to athlete motivation and effort. In the case of motivation, these behaviors are moderated by athlete narcissism (Arthur, Woodman, Ong, Hardy, & Ntoumanis, 2011). Using a qualitative methodology, Vallee and Bloom (2005) have also found that a coach's transformational leadership behavior is the core element in the holistic development of athletes and the building of successful University sporting programs.

Major contributors to this line of research have been Callow, Smith, Hardy, Arthur and Hardy (2009) who have shown that coach transformational leadership behaviors are linked to the positive athlete outcomes of social and task cohesion, as well as performance. Further, their contribution of an instrument to measure coach transformational leadership that is specific to the sporting context is a substantial one. Using adult ultimate Frisbee players, an adapted version of the Differentiated Transformational Leadership Inventory (DTLI) was shown to be a valid and reliable instrument that could be used to measure coach transformational leadership behaviors over seven key areas; individual consideration, inspirational motivation, intellectual stimulation, fostering acceptance of group goals and teamwork, high performance expectations, appropriate role model, and contingent reward. The inclusion of these seven key areas of coach behavior provide an important point of difference between the DTLI and the existing measures used to assess coaching behavior.

Of particular note are the general advantages derived from the 'individual consideration' and 'fostering acceptance of group goals and teamwork' subscales. Given that coaching is constituted by the relationship between coach and athlete (Vella et al., 2010), which itself is set among the context of the multiple interpersonal relationships between all athletes and coaches involved in team sports, these subscales provide valuable information on the social component of coaching. The importance of these components are demonstrated by research which concludes that the athlete experience of great coaching is more about the relationships and environment that the coach creates than a limited range of prescribed behaviors (Becker, 2009). This is furthered by demonstrable links between coach leadership behaviors, team cohesion, and psychological outcomes for athletes (Loughead, Patterson, & Carron, 2008), and coach leadership, the coach-athlete relationship and team cohesion (Jowett & Chaundry, 2004). Thus, measures of coach leadership will necessarily lose some element of meaning if they do not take into account both the individual and wider team dynamics aspect of coaching, making this a strength of the transformational leadership model in sports coaching.

More specifically, the transformational leadership model, as it is presented in the DTLI, has strong theoretical benefits for use within a youth sport context. The 'youth sport context' is defined by adolescent athletes aged 12 years and older who choose not to pursue an elite developmental trajectory. The theoretical emphasis of youth sports is on fun, challenge, enjoyment and the development of life-long skills (Côté et al., 2010; Vella et al., 2011), although it may not always play out this way in practice (Jones & Wallace, 2005). Organized leisure activities such as

youth sports provide a unique social context that lends itself to developmental gains as they provide a unique and favorable combination of motivation, attention and challenge that is not found in other activities such as schooling or unsupervised recreation (Larson, 2000). Consequently, youth who participate in sports report higher rates of learning experiences and life skill gains than those who participate in regular schooling and unsupervised time (Dworkin, Larson, & Hansen, 2003). This makes the measurement of motivation, attention and challenge an important component when assessing the leadership effectiveness of youth sports coaches.

The DTLI model, of all those reviewed above, is the only measure that incorporates such components. Specifically, the 'inspirational motivation' subscale provides important information on the impact of the coach on intrinsic motivation, while the 'intellectual stimulation' and 'high performance expectations' subscales provide valuable information on the challenge that athletes perceive from coaching behaviors. The strengths-based 'individual consideration' subscale is also theoretically important within this context because it is argued that the plasticity of adolescent development combined with a strengths-based approach leads to key developmental gains (Lerner, Almerigi, Theokas, & Lerner, 2005). Further, given that sports stand out from all other organized leisure activities as particularly bad when it comes to inappropriate adult behavior, subsequently poor moral and prosocial outcomes for young athletes (Hansen, Larson, & Dworkin, 2003), the coach as an 'appropriate role model' is of utmost importance. The inclusion of this component in the DTLI makes for a more comprehensive measure of youth coach leadership behavior, especially when considering developmental and psychosocial outcomes. Overall, the DTLI has strong theoretical benefits for use in a youth sports context because it provides a measure of unique components of coaching behavior that are potentially strong indicators of valuable developmental and psychosocial outcomes for young athletes.

Despite these strong theoretical benefits, the DTLI has yet to be substantiated within a youth sport context. Callow and colleagues (2009) have validated the DTLI within an adult population, however, qualitative differences between the youth sport and adult sport contexts means that effective coaching behaviors cannot be generalized between these contexts without validation (Côté & Gilbert, 2009). In particular, there are several important questions that need to be answered in relation to the validity of this measure within this context. Firstly, given participation youth sports should promote fun and playful competition over outright success (Côté et al., 2010; Côté & Gilbert, 2009), are 'high performance expectations' appropriate for this context? Secondly, considering the large range of ages that are incorporated into the 'youth sport context' where athletes are still undergoing cognitive, moral and social development (Gruber, Vonéche, & Piaget, 1977; Erikson, 1950; Kohlberg, 1984), are there age or sex differences which may indicate that the DTLI is not equally as valid for all athletes within a youth sport setting? Lastly, and more broadly, despite theoretical benefits, does the conceptualization of transformational leadership provided by the DTLI (Callow et al., 2009) remain valid with adolescent athletes engaged in participation sports?

Consequently, following important theoretical benefits, the purpose of this study is to take the Differentiated Transformational Leadership Inventory (Callow et al., 2009), which was originally validated using an adult population, and test its validity within a participation youth sport context. More specifically, this study

will seek to validate the DTLI within this context by confirming the underlying factor structure using a confirmatory factor analysis. Of particular interest is the applicability of the 'High Performance Expectations' subscale given that there is some theoretical doubt surrounding its compatibility with the participation youth sport context. Potential age and sex differences are also of interest to add to the understandability and generalisability of these findings.

# Method

## Participants

Participants were 322 youth aged soccer players from one medium socioeconomic status metropolitan area of Sydney, Australia. Two hundred and four participants were male (63%) and one hundred and eighteen were female (37%). Participants were aged between 11 and 18 years, with a mean age of 15.09 years (*SD* = 1.71). All participants competed within one soccer association, but represented 14 different clubs within this association. All participants were classified as participation players, where the theoretical emphasis of involvement in sport is not on winning. Participants typically engaged in a total of 1.5 hr of formal training per week, and competed once per week over a total of 18 consecutive weeks. Each player participated in a team of similarly skilled players and competed against teams who were graded as equal in standard. Postseason finals games were available to teams who finished in the top 4 of their 10-team competition.

## Measures

***Transformational Leadership.*** Transformational leadership was measured using the adapted version of the Differentiated Transformational Leadership Inventory (Callow et al., 2009). The adapted DTLI contains 27 items that form 7 subscales; individual consideration, inspirational motivation, intellectual stimulation, fostering acceptance of group goals and promoting team work, high performance expectations, appropriate role model, and contingency reward. Each item is rated on a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*all of the time*). Definitions of each subscale and corresponding items are given in Table 1. Following review of the DTLI by three researchers with expertise in developmental psychology, no changes were made to the wording of items. The DTLI shows a good model fit when incorporating all seven subscales ($\chi^2 = 499.1$, $\chi^2/df = 1.80$, RMSEA = 0.05, SRMR = 0.06, NNFI = 0.98, CFI = 0.98; Callow et al., 2009).

## Procedure

Each club within the soccer association was contacted to participate in the research. Each club was given responsibility for disseminating information to all registered players aged between 11 and 18 years and their caregivers. Written consent was obtained for all participants under the age of 16, and all participants aged over 16 years gave tacit consent by completing and returning the measure. The measure was completed in a quiet environment at the clubhouse of each club. Participants took between 5 and 15 min to complete the measure. Participants were assured of confidentiality,

**Table 1 Definitions of Each Subscale and Corresponding Items of the DTLI**

| Subscale Definition | Item |
|---|---|
| **Individual Consideration:** The extent to which the coach is able to understand and meet the individual needs for growth and development of each athlete. | 2. Treats each team member as an individual |
| | 4. Helps team members to develop their strengths |
| | 12. Considers that I have different strengths and abilities from others |
| | 16. Recognizes that different athletes have different needs |
| **Inspirational Motivation:** The extent to which the coach is able to motivate athletes by providing inspiration and an incentive to perform well. | 3*. Talks optimistically. . . |
| | 5. Talks in a way that makes me believe that I can succeed |
| | 7*. Talks enthusiastically. . . |
| | 19*. Expresses confidence. . . |
| **Intellectual Stimulation:** The extent to which the coach can challenge athletes cognitively. | 1(d). Tries to help us work out how to solve problems |
| | 9. Gets me to rethink the way that I do things |
| | 11. Shows performers how to look at difficulties from a new angle |
| | 21. Challenges me to think about problems in new ways |
| **Fostering Acceptance of Group Goals and Teamwork:** The extent to which the coach can facilitate team cohesion. | 13. Encourages athletes to be team players |
| | 15. Develops a strong team attitude and spirit among team members |
| | 23. Gets the team to work together for the same goal |

*(continued)*

**Table 1 *(continued)***

| Subscale Definition | Item |
|---|---|
| **High Performance Expectations:** The extent to which the coach provides high expectations for athlete behavior and performance. | 14. Expects a lot from us |
| | 18. Expects us to achieve high standards |
| | 22. Will not settle for second best |
| | 27. Always expects us to do our best |
| **Appropriate Role Model:** The extent to which the coach provides a positive behavioral model for athletes to follow. | 17. Leads by example |
| | 20. Leads from the front whenever he/she can |
| | 24. Leads by 'doing' rather than simply 'telling' |
| | 25. Is a good role model for me to follow |
| **Contingent Reward:** The extent to which the coach uses positive verbal reinforcement to strengthen desired athlete behaviors. | 6. Gives me special recognition when I do very good work |
| | 8. Gives us praise when we do good work |
| | 10. Praises athletes when they show improvement |
| | 26. Always recognizes our achievements |

* These three items are stems only of items from the MLQ-5X. All three items were used and reproduced with permission from the publisher, MINDGARDEN Inc., from the 'Multifactor Leadership Questionnaire for Research' by Bernard M. Bass and Bruce J. Avolio. Copyright 1995, 2000 by Bernard M. Bass and Bruce J. Avolio. All rights reserved. Further reproduction is prohibited without the publisher's written consent.

(d) This item was deleted following exploratory factor analysis.

with all parents and coaches leaving the room for survey completion. Participants placed completed surveys into an anonymous box provided by the research team.

## Data Analysis

Confirmatory factor analyses were used to test the underlying factor structure of the DTLI using AMOS 17. The $\chi^2$ statistic has been reported as it is the only true inferential statistic of model testing, despite its sensitivity to sample size (Markland, 2007). For this reason, the Normed Chi-Square Parameter ($c^2/df$) is also reported. A Normed Chi-Sqaure Parameter of 2 or less generally represents an acceptable model fit (Arbuckle & Wothke, 1999). Model fit was judged by Hu and Bentler's (1999) criteria, using a full-information maximum likelihood estimation for the Standardized Root Mean Square Residual (SRMR) in combination with the Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), and the Tucker-Lewis Index (TLI). The CFI and TLI are incremental fit indices which measure the proportionate improvement in fit by comparing the target model with a baseline model in which all of the observed variables are uncorrelated. The SRMR and RMSEA are summary measures of the standardized residuals. A combination of a CFI and TLI value of greater than .95, an SRMR value of less than .08, and a RMSEA of less than .06 represent a model that adequately fits the data (Hu & Bentler, 1999).

# Results

## Data Inspection

Data were inspected for normality and heterogeneity of variance. With the exception of the 'High Performance Expectations' and 'Inspirational Motivation', all subscales of the DTLI had a moderate negative skew (Skewness statistics from -.13 to -1.36) and moderate kurtosis values (Kurtosis statistics from .05 to .79). For ease of interpretation, all data were transformed using the square root transformation as described by Tabachnick and Fidell (2007). Following this transformation, data proved to be normally distributed (Skewness statistics from .01 to .51, and Kurtosis statistics from -.32 to .09). Analyses were therefore conducted using the transformed data. Missing data from 9 participants (3%) was replaced using the full information maximum likelihood method of estimation.

As participants were drawn from 14 different clubs, it was important to investigate any potential effects of club membership on the obtained data. Intraclass correlations for all measures showed that the correlation between scores for players from within each of the 14 clubs was not significantly different from zero ($p < .05$), indicating no effect of club membership on the data.

## Descriptive Statistics, Correlations and Scale Reliabilities

Means, standard deviations, and Cronbach Alpha coefficients for the full scale and all subscales are presented in Table 2. For understandability the untransformed statistics are presented. The full scale and all subscales showed acceptable internal consistency with Cronbach Alpha values of greater than .70. Pearson correlations on the untransformed statistics showed an acceptable consistency between total scores on the seven subscales. The correlation coefficients are presented in Table 3.

**Table 2 Untransformed Means, Standard Deviations and Cronbach Alpha Coefficients for the Full Scale and Each Subscale of the Original DTLI and Revised DTLI**

| | M | *SD* | *r* |
|---|---|---|---|
| DTLI | 108.21 | 18.16 | .946 |
| Individual Consideration | 16.63 | 3.19 | .806 |
| Inspirational Motivation | 16.59 | 3.05 | .795 |
| Intellectual Stimulation | 15.27 | 3.32 | .797 |
| Fostering Acceptance of Group Goals | 12.48 | 2.47 | .790 |
| High Performance Expectations | 15.07 | 3.27 | .731 |
| Appropriate Role Model | 15.35 | 3.76 | .844 |
| Contingent Reward | 16.81 | 3.42 | .877 |
| Revised DTLI | 89.11 | 16.24 | .953 |
| Individual Consideration | 16.63 | 3.19 | .845 |
| Inspirational Motivation | 16.59 | 3.05 | .778 |
| Intellectual Stimulation | 11.24 | 2.72 | .773 |
| Fostering Acceptance of Group Goals | 8.34 | 1.76 | .751 |
| Appropriate Role Model | 11.52 | 3.05 | .839 |
| Contingent Reward | 8.42 | 1.86 | .793 |

**Table 3 Factor Correlations of the Original and Revised DTLI**

| | | IC | IM | IS | ARM | FAGG | HPE | CR |
|---|---|---|---|---|---|---|---|---|
| DTLI | IC | 1 | | | | | | |
| | IM | .792 | 1 | | | | | |
| | IS | .699 | .696 | 1 | | | | |
| | ARM | .677 | .687 | .748 | 1 | | | |
| | FAGG | .735 | .786 | .716 | .708 | 1 | | |
| | HPE | .209 | .276 | .341 | .330 | .327 | 1 | |
| | CR | .750 | .760 | .671 | .698 | .790 | .178 | 1 |
| | TOTAL | .856 | .876 | .863 | .865 | .882 | .472 | .854 |
| Revised DTLI | IC | 1 | | | | | | |
| | IM | .792 | 1 | | | | | |
| | IS | .649 | .652 | 1 | | | | |
| | ARM | .677 | .687 | .722 | 1 | | | |
| | FAGG | .735 | .786 | .669 | .708 | 1 | | |
| | HPE | - | - | - | - | - | - | |
| | CR | .750 | .760 | .618 | .698 | .790 | - | 1 |
| | TOTAL | .881 | .891 | .817 | .869 | .887 | - | .886 |

## Confirmatory Factor Analyses

***Full Model With Seven Factors.*** Standardized factor loadings are presented in Table 4. Model fit was judged according to Hu and Bentler's (1999) criteria using CFI, RSMR, TLI and RMSEA values. This strategy for judging model fit shows that the DTLI model did not provide an acceptable fit for the obtained data. The SRMR value was comfortably within the cut-off limit (SRMR = .06), however, the CFI was short of reaching an acceptable limit (CFI = .92), as were the TLI and RMSEA values (TLI = .91, RMSEA = .06). Further, the Normed Chi-Square Parameter was short of an acceptable value ($\chi^2/df = 2.31$), with $\chi^2 = 700.45$ ($p = .000$).

***Full Model With 'High Performance Expectations' Removed.*** Model fit statistics improved when all items pertaining to 'High Performance Expectations' were removed. However, these statistics also fell short of cut-off criteria and therefore

**Table 4 Standardized Factor Loadings for Items of the Original and Revised DTLI**

| Item | Factor | Loading: original DTLI |
|---|---|---|
| 2 | IC | .631 |
| 4 | IC | .741 |
| 12 | IC | .637 |
| 16 | IC | .749 |
| 3 | IM | .605 |
| 5 | IM | .779 |
| 7 | IM | .728 |
| 19 | IM | .638 |
| 1 | IS | .644 |
| 9 | IS | .598 |
| 11 | IS | .768 |
| 21 | IS | .772 |
| 13 | FAGG | .756 |
| 15 | FAGG | .825 |
| 23 | FAGG | .658 |
| 14 | HPE | .689 |
| 18 | HPE | .754 |
| 22 | HPE | .666 |
| 27 | HPE | .556 |
| 6 | CR | .797 |
| 8 | CR | .801 |
| 10 | CR | .749 |
| 26 | CR | .846 |
| 17 | ARM | .808 |
| 20 | ARM | .686 |
| 24 | ARM | .743 |
| 25 | ARM | .822 |

this model did not provide an adequate fit for the obtained data ($\chi^2$ = 640.40, $p$ = .000; $\chi^2/df$ = 2.46; CFI = .93; TLI = .92; RMSEA = .07; SRMR = .04).

***One-Factor Model.*** Given moderate to high correlations between some subscale scores, potential multicollinearity was investigated by subjecting a one-factor model to confirmatory factor analysis. Model fit statistics fell substantially with this model ($\chi^2$ = 1280.67, $p$ = .000; $\chi^2/df$ = 2.94; CFI = .83; TLI = .81; RMSEA = .09; SRMR = .07).

## Exploratory Factor Analyses

Given that the obtained data did not produce a significant fit with the expected factor solution, an exploratory factor analysis was used to examine potential problem items. In particular, the exploratory factor analysis was used to examine the factor loadings and potential cross-loadings for each item. An exploratory factor analysis was subsequently conducted using the Promax with Kaiser Normalization method of rotation, principal axis factoring method of extraction, and retaining 7 factors. Items with a factor loading of .32 or above were retained, as suggested by Tabachnick and Fidell (2007). Items with a cross-loading of greater than .32 were also removed from the data set. Results showed that all items loaded onto the relevant factor at greater than .32, however, item 1 showed a high cross-loading and was subsequently removed from all subsequent analyses.

## Confirmatory Factor Analyses

***Full Model With Seven Factors.*** A confirmatory factor analysis was run on the revised DTLI that contained 26 items. The new factor correlations are presented in Table 3. Despite improvements in fit statistics, the revised model for the DTLI did not prove to be a good fit for the obtained data with a CFI value of .93, TLI value of .92, a RMSEA value of .06 and an SRMR value of .06. Further, $\chi^2$ = 607.32 ($p$ = .000), with the Normed Chi-Square Parameter also falling short of an acceptable threshold ($\chi^2/df$ = 2.18).

***Full Model With 'High Performance Expectations' Removed.*** Analyses were once again run following the removal of the 'High Performance Expectations' subscale. Model fit statistics show that this model is a good fit for the data ($\chi^2$ = 372.54, $p$ = .000; $\chi^2/df$ = 1.92; CFI = .96; TLI = .95; RMSEA = .05; SRMR = .04). As this model provides an adequate fit for the data, from here on it will be referred to as the 'revised DTLI'.

***One-Factor Model.*** Multicollinearity was also investigated on the revised DTLI by subjecting a one-factor model to confirmatory factor analysis. Once again, model fit statistics fell substantially with this model ($\chi^2$ = 1112.66, $p$ = .000; $\chi^2/df$ = 3.72; CFI = .82; TLI = .81; RMSEA = .09; SRMR = .08).

## Descriptive Statistics, Correlations and Scale Reliabilities

Means, standard deviations, and Cronbach Alpha coefficients for all the revised DTLI subscales are presented in Table 2. For understandability the untransformed statistics are again presented. The total scale and all subscales showed acceptable

internal consistency with Cronbach Alpha values of greater than .70. Untransformed correlation coefficients between the total scale and subscales on the revised DTLI are given in Table 3. These correlations show little change to correlations between the original subscales of the DTLI that are also presented in Table 3.

## Age and Sex Differences

One-way analysis of variance tests were used to gauge potential differences in the revised DTLI item responses by age. Results showed significant differences in mean item response between at least two ages in items 8, 11, 15, 19 and 22 ($p < .05$). Bonferroni analyses were subsequently used to identify the ages in which significant differences were recorded. These differences are shown in Table 5. Further, one-way analyses of variance were also used to examine potential differences in mean subscale scores by age. Significant differences were identified between at least two ages in the 'intellectual stimulation' subscale. Bonferroni analyses were again used to identify the areas of significant differences. These results are also presented in Table 5. There was no difference in total revised DTLI score by age ($p < .05$).

Independent sample *t* tests were used to examine differences in the revised DTLI mean item responses by sex. Significant differences were found in mean responses in item 9 (Male M = 3.81, *SD* = 1.06; Female M = 3.53, *SD* = 1.12), item 22 (Male M = 3.82, *SD* = 1.13; Female M = 3.53, *SD* = 1.10), and item 23 (Male M = 3.53, *SD* = 1.30; Female = 2.68, *SD* = 1.39). There were no differences by sex in total revised DTLI score or on any of the subscales of the revised DTLI ($p < .05$).

# Discussion

This study aimed to provide a valuable measure of coach leadership to the participation youth sport context by validating the DTLI within this population. In particular, this study aimed to assess the applicability of the 'high performance

**Table 5 Bonferroni Analyses of Significant Differences by Age**

| Item/subscale | Significant Differences by years of age (Mean) | *p* |
|---|---|---|
| 8 | 12 (3.52) vs 14 (4.34) | .029 |
| | 12 (3.52) vs 15 (4.50) | .002 |
| | 12 (3.52) vs 16 (4.30) | .048 |
| | 12 (3.52) vs 17 (4.33) | .047 |
| 11 | 14 (4.12) vs 12 (3.23) | .049 |
| | 14 (4.12) vs 18 (3.21) | .044 |
| 15 | 12 (3.48) vs 14 (4.39) | .007 |
| 19 | 14 (4.34) vs 18 (3.58) | .034 |
| 22 | 14 (4.15) vs 18 (3.00) | .007 |
| IS | 14 (12.24) vs 12 (9.86) | .026 |
| | 14 (12.24) vs 18 (9.68) | .017 |

expectations' subscale to participation youth sports, and given the large age range within this context, potential age and sex differences were also examined. Results show that the DTLI fell short of the model-fit criteria that are recommended by Hu and Bentler (1999). This was also true once 'high performance expectations' was removed, and for the one-factor model. While the initial factor loadings proved to be good (all above .30), there was a high cross-loading for item 1. Removal of item 1 as well as 'high performance expectations proved to be a good fit for data obtained within this context. To differentiate the DTLI from the revised model presented in this paper, the revised model is suggested as the Differentiated Transformational Leadership Inventory for Youth Sport (DTLI-YS). The DTLI-YS maintains six of the seven subscales proposed by Callow et al. (2009).

The changes that were necessitated may be due to the fact that the participation youth sports context is qualitatively different from other contexts including performance sports and participation sports for adults (Côté et al., 2010; Côté & Gilbert, 2009), in which previous studies have taken place. It is therefore unreasonable to expect that the DTLI be consistent over multiple coaching contexts. In particular, the most important finding is that 'high performance expectations' are not consistent with transformational leadership within this context. It is important to note that this finding does not mean that youth sports coaches do not place an emphasis on high performance. Rather, this finding suggests that high performance expectations are not compatible with the understanding of transformational leadership in participation youth sports. High performance expectations are undesirable in this context only to the extent that transformational leadership can be assumed to be an effective coach leadership style. This result is consistent with theoretical literature which places the emphasis of participation youth sports on fun, learning and challenge, as well as learning goal-orientations and a mastery climate (Côté et al., 2010; Côté & Gilbert, 2009; Smith & Smoll, 2010). Further, a major strength of the DTLI-YS is the inclusion of subscales used to measure the coach's influence on athlete motivation and challenge, as well as the influence of the coach as a role model, which make it particularly useful in a youth sport setting. Such constructs are lacking in the existing measures of coaching behavior, and provide an important point of difference between the DTLI-YS and existing measures. Therefore, future research should consider the DTLI-YS as a valid research tool within the participation youth sport context.

There are several important avenues available for this research. Given that the scientific study of positive youth development through sport has made significant gains in previous years and the important role that the coach plays in facilitating this development (Vella et al., 2011), investigating the impact of transformational leadership behaviors on developmental outcomes is recommended. Correlational research in the form of cross-sectional studies could be useful in establishing general relationship trends between the two variables, while causational research in the form of rigorous coach intervention studies are also warranted. The unique components of the DTLI-YS provide a solid foundation for this inquiry. For example, how does 'intellectual stimulation' transfer out of sport and impact upon a young athlete's ability to solve their life problems? How does 'individual consideration' impact upon the perception of one's strengths and subsequent perceptions of self-esteem? And, how does having an 'appropriate role model' impact upon the young athlete's moral decision-making? All of these unique components provide valuable areas

for theory-driven avenues of research. Further, given that positive developmental outcomes form the definition of coaching effectiveness (Côté & Gilbert, 2009), establishing the nature of the relationship between coach leadership and coaching effectiveness is an important step to take (Vella et al., 2010). This may be particularly so for participation youth sports where developmental outcomes such as confidence and character development take on increased significance (Côté et al., 2010).

The DTLI-YS can compliment existing measures of coach behavior which incorporate measures of technical and tactical instruction. These components are not included in the DTLI-YS. As such, the DTLI-YS is strictly a measure of coach leadership, and not a measure of overall coaching effectiveness, which also incorporates technical and tactical knowledge (Côté & Gilbert, 2009). The DTLI-YS can provide a measure of the 'interpersonal' component of effective coaching (Vella et al., 2010). The benefit of the DTLI-YS is that it is purely a measure of coach leadership, and consequently it can provide a more comprehensive analysis of leadership behaviors. This is particularly important for youth sports, as it is the quality of the adult leadership that determines the success or otherwise of organized programs aimed at youth development (Peterson, 2004). This is perhaps especially important in youth sports where negative developmental outcomes such as stress, pressure, and immoral decision making are just as likely as positive developmental outcomes such as interpersonal connections and self-esteem (Hansen et al., 2003) due to poor adult influences (Fraser-Thomas et al., 2005).

This study found minimal significant differences in item responses by age. These do not provide evidence of systematic differences between athletes as they progress through stages of development. This interpretation is strengthened by a lack of significant differences between eleven and eighteen year old athletes over any item or subscale, indicating that the behaviors measured by the DTLI-YS are applied equally to eleven year old athletes through to eighteen year old athletes. This result was not unexpected as effective coaching behaviors have been shown to be non-age-specific (Smoll & Smith, 2010). These results also suggest that coaches apply transformational leadership behaviors equally across gender. It is beyond the scope of this study to suggest that the consistent application of coaching behavior across genders is desirable. Research that correlates transformational leadership behaviors with positive athlete outcomes such as self-esteem and satisfaction with the sporting experience are needed before such inferences can be made.

Several limitations of this study warrant mention. Firstly, although this sample provides a good spread according to age and sex, it is relatively homogenous in terms of ethnicity, socioeconomic status, and sport played. This homogeneity limits the transfer of findings to alternate samples, in particular, to alternate sports including individual sports and to 'performance' sports. Further confidence in this measure is dependent upon replication within extended samples. Secondly, this sample was relatively small, particularly given that the DTLI contains 27 items that were subjected to analysis. However, given the positive results obtained, the small sample is not seen as a major limitation, especially given the reduced number of items in the revised model. Lastly, the DTLI-YS is not grounded in the coaching process. It is a prescriptive model of coach leadership that has not been derived from what actually takes place during coaching practice. As such the DTLI-YS provides a model 'for' coaching, rather than a model 'of' coaching (Cushion, Armour, & Jones, 2006). This is important because extra steps will need to be taken

to establish the DTLI-YS as prescriptive of effective coaching, rather than just an arbitrary prescription of coaching behaviors.

In conclusion, this study serves to confirm the DTLI-YS as a valid measure for use within a participation youth sport context. The use of this measure in applied coach leadership research is strongly recommended, within the limits of its generalisability. Given the importance of applied research to increasing knowledge of the coach leadership construct (Vella et al., 2010), this measure provides a useful research tool. It is possible that this measure can be used to provide empirical validation of the definition of coach leadership, or to examine the effectiveness of coach leadership behaviors. Importantly, these measures can be used to examine the impact of coach leadership on important developmental outcomes for young athletes, including competence, confidence, interpersonal and life skills, and character development (Côté & Gilbert, 2009; Vella et al., 2011). It is hoped that this study will provide the necessary impetus for this important naturalistic inquiry that can serve to provide the foundations for sport as a tool for positive youth development as well as important coach leadership research.

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