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Development and initial factor validation of the Violence Toward Athletes Questionnaire (VTAQ) in a sample of young athletes

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This study sought to develop and validate a questionnaire about violence experienced by children in sport. A convenience sample of 1055 French-Canadian athletes between 14 and 17 years old was recruited to participate in an online study assessing their experiences of interpersonal violence in sport. The Violence Toward Athletes Questionnaire (VTAQ) includes three subscales: athlete version (VTAQ-A), coach version (VTAQ-C), and parent version (VTAQ-P). Exploratory structural equation modeling (ESEM) was used to identify latent factors underlying versions of the VTAQ. The VTAQ-Athlete includes nine items with three factors: psychological (4 items), physical (2 items), and sexual (3 items). The VTAQ-Coach includes 36 items with three factors: psychological/neglect (16 items), physical (9 items), and sexual (11 items). The VTAQ-Parent includes 25 items with two factors: psychological/neglect (17 items) and physical (8 items). The VTAQ provides initial validation of the first measure by questioning children directly about their experiences of interpersonal violence in sport.

Keywords: violence; athletes; sport; questionnaire; validation

Cette étude vise à développer et valider un questionnaire portant sur la violence vécue par les enfants en sport. Un échantillon de convenance de 1 055 athlètes canadiens français âgés entre 14 et 17 ans a été recruté pour participer à une étude en ligne visant à documenter leurs expériences de violence interpersonnelle vécues dans le contexte sportif. Le *Violence Toward Athletes Questionnaire* (VTAQ) inclut trois sous-échelles : une version athlète (VTAQ-A), une version coach (VTAQ-C) et une version parent (VTAQ-P). Un modèle d'équations structurelles exploratoires (ESEM) a été utilisé pour identifier les facteurs latents qui sous-tendent les versions du QVAT. Le QVAT-Athlète inclut neuf énoncés répartis en trois facteurs : psychologique (4 énoncés), physique (2 énoncés) et sexuelle (3 énoncés). Le VTAQ-Coach inclut 36 énoncés répartis au sein de trois facteurs : psychologique/négligence (16 énoncés), physique (9 énoncés) et sexuelle (11 énoncés). Le VTAQ-Parent inclut 25 énoncés répartis au sein de deux facteurs : psychologique/négligence (17 énoncés) et physique (8 énoncés). Le QVAT constitue la validation initiale de la première mesure questionnant

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directement les enfants au sujet de leurs expériences de violence interpersonnelle vécue en contexte sportif.

Mots clés : violence; athlètes; enfants; sport; questionnaire; validation

1. Introduction

Violence against children in sport is recognized as an important issue (Lang & Hartill, 2015; Mountjoy *et al.*, 2016; Parent & Fortier, 2018). Recently, studies have shown that there is a substantial amount of interpersonal violence against athletes in sport and this should be a cause for concern (Alexander, Stafford, & Lewis, 2011; Evans, Adler, Macdonald, & Cote, 2016; Parent, Lavoie, Thibodeau, Hébert, & Blais, 2016; Vertommen *et al.*, 2016). Vertommen *et al.* (2016) interviewed over four thousand Belgian and Dutch adults regarding their experiences of interpersonal violence before the age of 18 in a sports context. Results of this study showed that 44% of participants reported having experienced at least one form of violence in sport (sexual, psychological, or physical). Specifically, the authors reported that 11% of respondents experienced physical violence, 38% experienced psychological violence, and 14% experienced sexual violence. Besides these numbers, we also know that violence experienced by children in sport is associated with mental health problems and a lower quality of life in adulthood (Vertommen, Kampen, Chipper-van Veldhoven, Uzieblo, & Van Den Eede, 2018). Despite the magnitude and consequences of this recently demonstrated problem in research, studies attempting to measure it are scarce and contain a number of limitations, which hinder accurate measurement.

A first limitation is of a conceptual nature. Specifically, the meager attention granted to neglect in research designs and the way physical violence is understood or measured in sport are two important limits from a conceptual point of view. Yet, the concept of neglect in sport has been identified as an integral constituent of violence and abuse against children in this context (Brackenridge, Fasting, Kirby, & Leahy, 2010; Mountjoy, Rhind, Tiivas, & Leglise, 2015; Mountjoy *et al.*, 2016; Stirling, 2009). Moreover, neglect is internationally recognized as a form of child abuse (Krug, Dahlberg, Mercy, Zwi, & Lozano, 2002; Stoltenborgh, Bakermans-Kranenburg, & van Ijzendoorn, 2013). However, neglect was not specifically addressed in recent global studies on violence against children in sports (Alexander *et al.*, 2011; Vertommen *et al.*, 2016). The operationalization of physical violence in studies on violence against children in sport is also problematic. Indeed, the majority of sport researchers favor a definition of physical violence that emphasizes actual or implied potential physical harm to the athlete (also referred to as physical abuse), rather than the purely physical nature of the aggression (Alexander *et al.*, 2011; David, 2005; Stirling, 2009). Thus, in addition to documenting events that are generally considered physical violence (e.g., pushing, hitting, or punching), some authors have incorporated events that do not involve any physical contact in their definition of physical violence, such as the imposition of excessive and intensive training (Alexander *et al.*, 2011; David, 2005; Mountjoy *et al.*, 2015; Stirling, 2009; Vertommen *et al.*, 2016), the forced pursuit of training and competition despite the presence of an injury or exhaustion (Alexander *et al.*, 2011; Raakman, Dorsch, & Rhind, 2010), the imposition of doping products consumption (David, 2005), or the imposition of severe diets to lose weight (Brackenridge *et al.*, 2010; David, 2005). However, literature outside sports considers that the definition of physical violence needs to be centered on the nature of the gestures (physical contact) toward the child rather than on the consequences (physical) of these gestures when defining

manifestations (Butchart, Phinney Harvey, Mian, Fürniss, & Kahane, 2006; Clément & Dufour, 2009; Trocmé *et al.*, 2010). So, these important manifestations should be included in questionnaires about violence in sport but would probably be better categorized as psychological violence rather than physical violence (see Fortier, Parent, & Lessard, 2018 for a more detailed explanation).

A second important limitation lies in the type of perpetrator studied. For example, studies looking at prevalence of violence against children in sports did not, to our knowledge, include parents as potential perpetrators of violence toward their child in this context. Vertommen *et al.* (2017) have an 'other known' category that *could* include parents as perpetrators, but precise data is not given; therefore, it is not possible to determine what kind of violence children may experience from their parents with relation to their sports practice. Also, the tools used by Vertommen *et al.* (2016) and Alexander *et al.* (2011) did not have specific and context-dependent items regarding the type of perpetrator.

This can create an underestimation of certain forms of violence such as sexual abuse. Indeed, this reflects previous recommendations with regard to questioning young athletes about sexual violence from a coach (Parent & Fortier, 2017; Parent *et al.*, 2016) where terms like 'forced' or 'unwanted' are irrelevant because of the absence of valid consent in those cases (Mathews & Collin-Vézina, 2019). This calls for a tool having specific items in relation to the kind of perpetrator. This is, to us, the best way to ensure capturing cases of normalization, especially in cases of abuse happening within a relationship of authority.

The third limitation is that the vast majority of studies pertaining to the problem's magnitude with children were conducted on specific forms of violence such as sexual violence (Johansson & Lundqvist, 2017; Ohlert, Seidler, Rau, Rulofs, & Allroggen, 2018; Parent *et al.*, 2016). This is a limitation to understanding the whole phenomenon and the links between different forms of victimization. Many researchers on victimization recommend studying violence in a more comprehensive way so as to better understand common risk factors and be more efficient in prevention efforts (Finkelhor, Ormrod, & Turner, 2007; Finkelhor, Shattuck, Turner, Ormrod, & Hamby, 2011; Hamby, Finkelhor, Turner, Grych, & Banyard, 2017).

The last set of limitations we observed concerns methodological issues when measuring the prevalence of violence toward young athletes. For example, the use of retrospective design with adults to assess childhood victimization in sport (e.g., Alexander *et al.*, 2011; Vertommen *et al.*, 2016) can affect the accuracy of recollecting childhood events and introduce a memory bias (Bernstein *et al.*, 2003; Cyr, 2014). Recent studies have demonstrated the relevance of conducting research with teenagers (Finkelhor, Vanderminden, Turner, Hamby, & Shattuck, 2014; Priebe, Backstrom, & Ainsaar, 2010; Ybarra, Langhinrichsen-Rohling, Friend, & Diener-West, 2009). Also, despite progress in the field, questionnaires used to measure violence against children in sport, to our knowledge, are still not systematically validated. Yet, researchers in sports have emphasized the importance of having validated tools to ensure the quality of measurement in this domain (Stirling, 2009; Vertommen *et al.*, 2017). Research on the causes and consequences of child abuse and neglect has often been hampered by invalidated instruments (Bernstein *et al.*, 2003).

In light of these limitations, the present study seeks to develop and validate a questionnaire that assesses all forms of interpersonal violence toward children in sport (including neglect) perpetrated by coaches, parents, and peer athletes with a sample of teenagers. It is worth noting that the term 'children' includes young children as well as teenagers. For instance, the term 'child' includes teenagers in the child sexual

abuse literature (see Mathews & Collin-Vézina, 2019). This tool aims to address the problems of measuring violence toward children in sport identified above.

2. Method

2.1. Participants and procedure

A convenience sample of French-Canadian athletes between the ages of 14 and 17, who were participating in organized sports (playing within a league, club, or sports team with organized training and competition) at the moment of the study, was recruited to participate in an online study assessing their experiences in sport. Participants were recruited on a voluntary basis through different recruitment strategies, such as the distribution of a hyperlink to the study via mailing lists of sports partners, the distribution of flyers in sports competitions, and advertising of the study via social media. Interested participants accessed an anonymous survey through a hyperlink hosted by a secured online survey software, Qualtrics, where they electronically signed a consent form before starting the questionnaire. The completion time ranged from 30 to 45 minutes. A list of resources (e.g., helplines for youth, psychologist) was included in the consent form, at the end of the questionnaire, and also on the study's website. Considering that a parent might have been a perpetrator of violence against young athletes, parental consent was not required. The field of research on violence against athletes is evolving even if this is a sensitive topic. Indeed, some fears were expressed by the scientific community saying that questioning children about their negative experiences may cause discomfort, distress, and traumatize them again. However, several recent studies have shown that youth participation in violence-related research does not appear to provoke serious distress reactions (Finkelhor *et al.*, 2014; Fisher, Arbeit, Dumont, Macapagal, & Mustanski, 2016; Jaffe, DiLillo, Hoffman, Haikalis, & Dykstra, 2015; Macapagal, Coventry, Arbeit, Fisher, & Mustanski, 2017). Indeed, the vast majority of young people who participated in such studies reported that they would participate again and that the benefits they perceived were greater than the discomfort they experienced when participating, suggesting that the value of such participation outweighed their discomfort.

A total of 1259 athletes met inclusion criteria and began the online survey. Among these, 1055 (83.8%) completed the VTAQ and were included in this study. The final sample consisted of 763 girls (72.3%) and 292 boys (27.7%). Participants' ages range from 14 to 17, with a mean of 15.29 years ($SD = 1.07$). Most participants reported that they were Canadian (95.3%, $n = 1005$) and that they were attracted only to persons of the other sex (87.9%, $n = 927$). Most reported that they practice only one sport (62.7%, $n = 662$) with 37.3% ($n = 393$) reporting practicing at least two sports. The sports practiced varied widely with soccer (21.0%, $n = 222$), volleyball (13.0%, $n = 137$), swimming (10.8%, $n = 114$), ice hockey (9.5%, $n = 100$), basketball (8.0%, $n = 84$), track and field (7.1%, $n = 75$), cheerleading (6.9%, $n = 73$), and American football (4.6%, $n = 49$) being the most common. A total of 26.4% ($n = 279$) reported that they were competing in their sport at the local or regional/interregional level, 46.6% ($n = 492$) at the provincial level, 20.6% ($n = 217$) at the national level, and 5.4% ($n = 57$) at the international level. A total of 14.3% ($n = 151$) of athletes reported that they practiced their sport less than five hours a week, 37.3% ($n = 393$) between 6 and 10 hours a week, 26.4% ($n = 278$) between

11 and 15 hours a week, 14.0% ($n = 148$) between 16 and 20 hours a week, and 8.1% ($n = 85$) more than 20 hours a week.

2.2. Measures

2.2.1. Development of the VTAQ

The Violence Toward Athletes Questionnaire (VTAQ) was developed to assess self-reported experiences of interpersonal violence in sports based on the perpetrator of the violence. The VTAQ included three subscales: other athlete version (VTAQ-A), coach version (VTAQ-C), and parent version (VTAQ-P). Each version included different types of violence in sports. The athlete version (teammates and opponents) included nine items: four items for psychological violence, two items for physical violence, and three items for sexual violence. The coach version included 37 items: 14 items for psychological violence, six items for neglect, six items for physical violence, and 11 items for sexual violence. The parent version included 26 items: 14 items for psychological violence, six items for neglect, and six items for physical violence. To ensure capturing violence from parents in the context of sports, we asked participants questions using specific terms: 'Because of your athletic performance or your behavior in training or competition, one of your parents ...' We also had items explicitly related to sports, such as: 'One of your parents has already forced you or asked you to train injured while you had a contrary medical opinion.' Participants rated the frequency with which various events took place in the sports context on a 4-point Likert scale where 0 = *never*; 1 = *rarely, 1 to 2 times*; 2 = *sometimes, 3 to 10 times*; 3 = *often, more than 10 times*. This choice of scale was made based on the recommendations of experts during the development phase (see below).

The development of these items was based on the steps for scale development proposed by DeVellis (2012). The first step was to clearly determine what constitutes violence against athletes. In this project, the definition used to understand violence is the one from the World Health Organization (WHO): 'the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, mal-development or deprivation' (Krug *et al.*, 2002, p. 5). Despite the fact that self-directed and collective violence could be very interesting to measure in sports, we chose to focus solely on interpersonal violence. Hence, the WHO typology of violence was used to determine the four forms of interpersonal violence, namely sexual, psychological, and physical violence as well as neglect (Krug *et al.*, 2002). A literature review allowed the team to list the different kinds of manifestations of violence toward athletes in each of these forms of violence. The conceptual framework of abuse in sport proposed by Stirling (2009) was also a great source of inspiration. Nine focus groups were also organized with 60 young athletes (35 girls and 25 boys) aged between 12 and 17 (average age 14.8 years old) to explore their perception of the concept of violence in sport and its manifestations. At the time of the study, all participants were practicing an organized sport in a variety of clubs in Quebec City and had previously competed at a local, regional, provincial, national, or international level. A wide diversity of sports was represented in the sample (team, individual, esthetic, or combat sport). These focus groups lasted between 35 and 65 minutes.

The second step was to generate a first pool of items. Therefore, based on the previous step, a conceptual framework (Fortier *et al.*, 2018) was created integrating results of the literature review, information from the focus groups, and previous

frameworks and items used in the existing works of Butchart *et al.* (2006) and Trocmé *et al.* (2010) on child abuse. A second pool of items was then generated. In the third step, this pool of items was submitted to 16 experts from diverse backgrounds such as child abuse, sports studies, and bullying to assess content validity. They suggested including, excluding, or modifying some items. This process led us to undertake the fourth step, where we considered the inclusion of selected items. During the fifth step, we conducted 10 individual semi-structured interviews with young athletes aged between 14 and 17 to collect narrative descriptions of reported victimization as well as information on their understanding (e.g., wording) of items. Possible overestimations and underestimations due to literal interpretations of items or discomfort related to disclosure were also assessed at this stage, as recommended by Finkelhor, Hamby, Ormrod, and Turner (2005). These phases of data collection were also approved by the ethics committee of the institution. The final step was to administer the questionnaire to a sample of young athletes, the results of which are presented below after an overview of the definitions used.

Definitions used for the development of the VTAQ are presented in the next lines for clarity. Sexual violence was defined as ‘a sexual act that is committed or attempted by another person without freely given consent of the victim or against someone who is unable to consent or refuse’ (Basile, Smith, Breiding, Black, & Mahendra, 2014, p. 11). In Canada, where the study was being conducted, when sexual activity occurs in a relationship of authority, trust, or dependency (e.g., coach), the age of consent is 18 years old. Thus, items on sexual violence perpetrated by a coach did not need to be identified as ‘unwanted’ by the athletes, whereas those from another athlete did. Items of sexual violence included sexual harassment (e.g., offensive sexual remarks on sexual life, on the body), sexual assault (e.g., unwanted sexual contacts), contact and non-contact child sexual abuse (e.g., voyeurism, exposure to pornography, sexual intercourse). Physical violence was defined as any action of a physical nature that compromises or threatens the integrity, or the physical or the psychological well-being of a person (Clément & Dufour, 2009). Items included hitting, pushing, or shaking an athlete. Psychological violence was defined as acts which include restriction of movement, patterns of belittling, denigrating, scapegoating, threatening, scaring, discriminating, ridiculing, or other nonphysical forms of hostile treatment or rejection (WHO, 1999). Items included behaviors of authority figures that promote the corruption, exploitation, and adoption of destructive, anti-social, or unhealthy behaviors of a young athlete in the context of sport (e.g., force an athlete to train injured despite medical advice, force an athlete to commit acts of violence) This category was added on the basis of items recognized as psychological maltreatment by Trocmé *et al.* (2010). Finally, neglect was defined as:

The failure to provide for the development of the child [...] in the context of resources reasonably available to the family or caretakers, and causes or has a high probability of causing harm to the child’s health or physical, mental, spiritual, moral or social development. This includes the failure to properly supervise and protect children from harm as much as is feasible. (WHO, 1999, p. 15)

Items included, for example, ‘permits participation in training and/or competition whilst injured and despite medical advice not do so’ or ‘letting an athlete endure a violent act from another athlete without intervening.’ Items of neglect were used only for the coach and the parent scale.

2.3. Statistical analyses

To identify latent factors underlying each version of the VTAQ, we conducted exploratory structural equation modeling (ESEM; Asparouhov & Muthén, 2009) using *Mplus* version 8.0 (Muthén & Muthén, 1998–2015). ESEM incorporates the benefits of both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) into a single analytic framework. In ESEM, a given number of factors are specified based on a priori assumptions and modifications are made based on loadings, tests of significance, and fit indices. Compared to CFA, in which all cross-loadings are specified to be zero, in ESEM all factor loadings are estimated such that each item is free to cross-load on other factors and will have as many secondary loadings as there are factors. ESEM allows for the testing of cross-loadings, thus an exploration of complex factor structures with modeling flexibility (Asparouhov & Muthén, 2009; Marsh, Morin, Parker, & Kaur, 2014). The covariances between factors are included in the models. We used the oblique geomin rotation and the Weighted Least Squares Mean and Variance-adjusted (WLSMV) estimator (Asparouhov & Muthén, 2010). As we dealt with ordered categorical indicators, item-level missingness was treated using the weighted least squares estimation, which is analogous to full information maximum likelihood (Asparouhov & Muthén, 2010). Based on Kline's guidelines (2011), the overall model fit was evaluated by considering together several fit indices: the comparative fit index (CFI), the Tucker-Lewis fit index (TLI), the root mean square error of approximation (RMSEA), and the weighted root-mean-square residual (WRMR). CFI and TLI values greater than .90 and .95 typically reflect acceptable and excellent fit, RMSEA values of less than .08 and .05 reflect a reasonable and close fit to the data, and WRMR values below or close to 1.00 indicated good models with categorical outcomes (Hu & Bentler, 1999). After the identification of the best number of factors, descriptive and correlational analyses were computed with the Statistical Package for the Social Sciences (SPSS 24.0) with a significance level of $p < .05$.

3. Results

3.1. Exploratory Structural Equation Model of the VTAQ-Athlete

As hypothesized during the development of the athlete version of the VTAQ, we first estimated ESEM with three factors. This three-factor model provided an acceptable fit to the data, $\chi^2(12) = 23.01$, $p = .028$; RMSEA = .029, 90% CI [.010 to .048]; CFI = 0.995; TLI = 0.986; WRMR = 0.396. Standardized factor loadings and correlations between factors of the three-factor solution of VTAQ-Athlete are reported in Table 1. The first factor represented physical violence and included two items, the second factor represented psychological violence and included four items, and the third factor represented sexual violence and included three items. One item (VTAQ-A7) loaded onto the psychological (factor 2) and the sexual factors (factor 3), which is not surprising as this item represents offensive sexual remarks which may also represent psychological violence. Given the sexual nature of this item, we kept it on the sexual subscale. The final version of the VTAQ-Athlete is presented in the supplementary material A and includes the nine items with three subscales: psychological (4 items), physical (2 items), and sexual (3 items).

Table 1. Factor loadings and factor correlations of three-factor ESEM for the VTAQ from other athletes.

Items	Factor 1 Physical	Factor 2 Psychological	Factor 3 Sexual
VTAQ-A5	.664	-.004	.088
VTAQ-A6	.941	.041	.026
VTAQ-A1	-.052	.695	.131
VTAQ-A2	.118	.850	.008
VTAQ-A3	.301	.339	.119
VTAQ-A4	.283	.577	.125
VTAQ-A7	.212	.384	.388
VTAQ-A8	.052	-.068	.912
VTAQ-A9	.000	.134	.706
F1	-	.376	.286
F2	-	-	.340

Note: ESEM = exploratory structural equation modeling. VTAQ = violence in sport questionnaire. Coefficients in bold represent the items included in this factor.

3.2. Exploratory Structural Equation Model of the VTAQ-Coach

Estimation of the 37 items yielded a problematic model as nine items had a very low variance (variance < .03). We had to remove these items from the model in order to obtain an acceptable model. We inspected the frequency of these experiences of violence and, even if some items were reported only by a minority of athletes, these items were kept in the questionnaire as even extreme forms of violence need to be assessed (VTAQ-C6, VTAQ-C14, VTAQ-C21, VTAQ-C24, VTAQ-C30, VTAQ-C31, VTAQ-C32, VTAQ-C34, VTAQ-C36). Re-estimating the ESEM without these low-variance items, the best-fitting model included three factors instead of four as hypothesized during the development of the athlete version of the VTAQ. The items developed for psychological violence and neglect loaded onto the same factor, thus we named this factor the psychological violence and neglect subscale. One item loaded lowly on all three factors (loading < .25). We decided to remove this item as it may not represent a neglectful behavior, contrary to what Stirling (2009) suggested: ‘has ever allowed you to use alcohol or drugs during activities related to your sports practice.’

The final ESEM with 27 items onto three factors provided an acceptable fit to the data, $\chi^2(273) = 524.41$, $p < .001$; RMSEA = .030, 90% CI [.026 to .033]; CFI = 0.958; TLI = 0.946; WRMR = 1.03. Standardized factor loadings and correlations between factors of the three-factor solution with 27 items of the VTAQ-Coach are reported in Table 2. The first factor represented psychological violence and neglect which included 13 items, the second factor represented sexual violence and included six items, and the third factor represented physical violence and included eight items. Three items were developed to be included in the psychological subscale (VTAQ-C7, VTAQ-C8, VTAQ-C9), but loaded highly on the physical violence factor and poorly on the psychological violence and neglect factor. As these items include a physical act from the perpetrator or from an athlete (such as physical behaviors not directed to the athlete, asking the athlete to be violent, or letting the athlete be violent with an opposing athlete), we decided to move these items in the physical violence subscale. Again, the item representing

Table 2. Factor loadings and factor correlations of three-factor ESEM for the VTAQ from coach.

Items	Factor 1 Psychological and neglect	Factor 2 Sexual	Factor 3 Physical
VTAQ-C10	.661	.071	.118
VTAQ-C11	.747	-.100	.343
VTAQ-C12	.824	-.121	.268
VTAQ-C13	.799	-.186	.188
VTAQ-C15	.577	.170	.095
VTAQ-C16	.776	-.181	.245
VTAQ-C17	.541	.226	-.081
VTAQ-C18	.751	.261	-.142
VTAQ-C19	.682	.295	-.130
VTAQ-C20	.638	.291	-.599
VTAQ-C22	.538	.256	-.027
VTAQ-C23	.583	.318	-.494
VTAQ-C25	.405	.204	.133
VTAQ-C26	.485	.376	.092
VTAQ-C27	.038	.728	.148
VTAQ-C28	-.042	.986	.010
VTAQ-C29	-.045	.878	.070
VTAQ-C33	-.005	.919	.019
VTAQ-C35	.033	.934	.174
VTAQ-C1	.254	.259	.422
VTAQ-C2	.052	.344	.504
VTAQ-C3	.270	.412	.447
VTAQ-C4	.199	.342	.444
VTAQ-C5	.030	.466	.592
VTAQ-C7	.160	.261	.395
VTAQ-C8	.047	.102	.842
VTAQ-C9	.023	.049	.917
F1	-	.306	.167
F2	-	-	.236

Note: ESEM = exploratory structural equation modeling. VTAQ = violence in sport questionnaire. Coefficients in bold represent the items included in this factor.

offensive sexual remarks (VTAQ-C26) loaded onto the psychological and the sexual factors. Given the sexual nature of this item, we kept it in the sexual subscale. The final version of the VTAQ-Coach is presented in the supplementary material B and includes the 36 items with three subscales: psychological and neglect (16 items), physical (9 items), and sexual (11 items).

3.3. Exploratory Structural Equation Model of the VTAQ-Parent

Estimation of the 26 items yielded a problematic model as seven items had a very low variance. We had to remove these items from the model to obtain an acceptable model. However, we inspected the frequency of these violent experiences and, in line with the coach version, these items were kept in the questionnaire as even extreme forms of violence need to be assessed (VTAQ-P4, VTAQ-P5, VTAQ-P6, VTAQ-P12, VTAQ-P13, VTAQ-P20, VTAQ-P23). Re-estimating the ESEM without these items, the best-fitting model included two factors instead of three as hypothesized during the

development of the parent version of the VTAQ. The items developed for psychological violence and neglect loaded onto the same factor; thus, we named this factor the psychological violence and neglect subscale. One item loaded lowly on both factors (loading < .30). In line with the coach version, we decided to remove this item: 'has ever allowed you to use alcohol or drugs during activities related to your sports practice.'

The final ESEM with 18 items onto two factors provided an acceptable fit to the data, $\chi^2(118) = 274.81, p < .001$; RMSEA = .036, 90% CI [.031 to .042]; CFI = 0.960; TLI = 0.948; WRMR = 0.982. Standardized factor loadings and correlations between factors of the two-factor solution with 18 items of the VTAQ-Parent are reported in Table 3. The first factor represented physical violence and included five items and the second factor represented psychological violence and neglect, which included 13 items. Two items were developed to be included in the psychological subscale (VTAQ-P7, VTAQ-P8), but the VTAQ-P7 loaded highly on the physical violence factor and poorly on the psychological violence and neglect factor, whereas the VTAQ-P8 loaded on both factors. To be in line with the coach version, these items were moved in the physical violence subscale. Four items were developed for the psychological subscale but loaded on both factors (VTAQ-P9, VTAQ-P10, VTAQ-P11, VTAQ-P14). They were kept in the psychological violence and neglect subscale as they represented this type of violence. The final version of the VTAQ-Parent is presented in the supplementary material C and includes the 25 items with two subscales: psychological and neglect (17 items) and physical (8 items).

Table 3. Factor loadings and factor correlations of the two-factor ESEM for the VTAQ from parents.

Items	Factor 1 Physical	Factor 2 Psychological and neglect
VTAQ-P1	.783	.157
VTAQ-P2	.964	-.009
VTAQ-P3	.892	-.003
VTAQ-P7	.705	.204
VTAQ-P8	.399	.409
VTAQ- P9	.536	.327
VTAQ- P10	.534	.478
VTAQ- P11	.433	.523
VTAQ- P14	.409	.416
VTAQ- P15	.030	.850
VTAQ- P16	.072	.685
VTAQ- P17	-.017	.854
VTAQ- P18	.004	.879
VTAQ- P19	-.351	.998
VTAQ- P21	.045	.607
VTAQ- P22	-.477	.898
VTAQ- P24	.167	.624
VTAQ- P25	.010	.639
F1	-	.465

Note: ESEM = exploratory structural equation modeling. VTAQ = violence in sport questionnaire. Coefficients in bold represent the items included in this factor.

3.4. Descriptive statistics and correlations of the VTAQ subscales

Internal consistency of all subscales of the three versions of the VTAQ was acceptable. Ordinal coefficient alphas estimated using the polychoric correlation matrix (Zumbo, Gadermann, & Zeisser, 2007) are reported in Table 4. Items were summed by subscale, and means, standard deviations, and correlations are reported in Table 4. All correlations between subscales and versions were significant. Correlations between subscales of the VTAQ-Athlete varied between .27 and .45, those between the subscales of the VTAQ-Coach varied between .26 to .32, and the one between the two subscales of the VTAQ-Parent was .46. We noted more important correlations between the psychological subscales from all three types of perpetrators with correlations that varied between .37 and .52.

4. Discussion

This study sought to develop and validate a questionnaire about interpersonal violence toward athletes (VTAQ). To our knowledge, the VTAQ is the first measurement tool to directly question child athletes about their experiences of interpersonal violence in the sports context. Three versions of the VTAQ were developed to assess self-reported experiences of interpersonal violence in sports based on the perpetrator of the violence: other athlete version (VTAQ-A), coach version (VTAQ-C), and parent version (VTAQ-P). As expected, our results showed that the VTAQ-A has a three-factor structure: sexual, physical, and psychological violence. Contrary to what we anticipated, our results show that the VTAQ-C is not a four-factor structure (sexual, physical and psychological violence, neglect), but rather a three-factor structure, namely sexual violence, physical violence, and psychological violence/neglect (combined). This could be explained by the fact that psychological violence and neglect are concepts that are often linked together. Indeed, research on child abuse indicates a strong correlation between psychological abuse and emotional neglect and sometimes even combines these into an emotional maltreatment category (Allen, 2008; Barnett, Manly, & Cicchetti, 1993; Bernstein *et al.*, 2003). Although we used terms like 'forced or asked to' for items of psychological violence and terms referring to an omission or failure for items related to neglect, those items were closely linked in light of our analysis. So, while these concepts may appear to be 'conceptually' different (psychological violence vs. neglect), in the VTAQ-P and VTAQ-C, psychological violence and neglect are sufficiently linked to constitute a single factor. For parents, contrary to what was expected, the VTAQ-P does not have a three-factor structure (physical violence, psychological violence and neglect), but rather, a two-factor structure (physical violence, psychological violence/neglect). The same reasons as mentioned above for the VTAQ-C seem to explain this result. The VTAQ-P does not include sexual violence items because we wanted to restrict items related to parents to a sports-related context. We considered that items of psychological violence, physical violence, and neglect were more susceptible to be related to the sports context, such as the use of these forms of violence toward their children because of their performance or behavior in training or competition. We also added items about psychological violence and neglect clearly linked to the sports context, such as asking their child to limit or restrict their social relationships to better invest in sport, or to force them to compete injured despite medical advice not to do so.

Table 4. Descriptive statistics and bivariate correlations for the Violence Toward Athletes Questionnaire (VTAQ).

	# items	<i>a</i>	<i>M</i> (range)		1.	2.	3.	4.	5.	6.	7.
			<i>n</i> = 997	<i>SD</i> to 1055							
1. VTAQ-A psycho	4	.81	1.77 (0-12)	2.10	-						
2. VTAQ-A physical	2	.80	0.36 (0-6)	0.91	.32***	-					
3. VTAQ-A sexual	3	.79	0.39 (0-8)	0.89	.45***	.27***	-				
4. VTAQ-C psy/neg	16	.93	3.12 (0-30)	4.32	.46***	.17***	.31***	-			
5. VTAQ-C physical	9	.90	0.70 (0-20)	1.65	.25***	.36***	.29***	.32***	-		
6. VTAQ-C sexual	11	.98	0.28 (0-28)	1.47	.19***	.16***	.43***	.26***	.31***	-	
7. VTAQ-P psy/neg	17	.95	1.51 (0-24)	2.98	.37***	.17***	.35***	.52***	.25***	.33***	-
8. VTAQ-P physical	8	.96	0.25 (0-14)	1.05	.16***	.14***	.24***	.20***	.33***	.37***	.46***

Note: VTAQ-A = Violence Toward Athletes Questionnaire-Athlete. VTAQ-C = Violence Toward Athletes Questionnaire-Coach. VTAQ-P = Violence Toward Athletes Questionnaire-Parent.
 ****p* < .001.

During the development phase of the VTAQ, we decided to classify items not involving direct physical contact with athletes in the category of psychological violence (except for sexual violence and only for VTAQ-C and VTAQ-P). Our results demonstrated that some items anticipated being classified as psychological violence were, in fact, associated with the physical violence factor, such as ‘hitting or throwing objects not directed to you’ or ‘force an athlete to injure another athlete during a match.’ This could be explained by the fact that those events imply a violent physical act from the athlete or the perpetrator. However, items considered as physical abuse in the literature such as being forced to train injured (Alexander *et al.*, 2011) were associated with psychological violence, as we have anticipated. Thus, the nature of the ‘visible impact’ on an athlete seems not to be an important criterion to classify these items as physical violence or abuse.

5. Limitations and future research

The VTAQ was designed for young athletes aged between 14 and 17 from any type of sport and level of competition. However, this questionnaire could be applied to adults who have been athletes when they were children. In doing so, the VTAQ could be used in retrospective studies. A convenience sample was used to develop and validate the factorial structure of the VTAQ. This sample may not be representative of all athletes between 14 and 17. Another limitation is that even if ESEM incorporates an exploratory and confirmatory approach, this validation remains exploratory and future studies should confirm the factorial validity of this scale. The combination of items into subscales is preliminary and should be validated. Moreover, some items with low variance, which represents low frequency of this type of violence, could not be added to our statistical model, and thus we could not confirm the factorial validity of our subscales with these items. Future research on the VTAQ should use a larger representative sample which would allow testing items with a very low variance and occurrence (e.g., sexual abuse, some items on physical violence).

Each respondent was only subjected to a single measurement, so we cannot examine the test-retest reliability. Also, future research should extend the preliminary results presented here by adding measures of convergent validity to further assess the psychometric qualities of the instrument. Convergent validity could be measured by using mental health measures, as we know that violence is associated with mental health problems (Vertommen *et al.*, 2018). The sensitivity and convergence of the VTAQ should also be compared with structured interviews, therapists’ ratings, or official child welfare records. These further analyses would help measure the severity of interpersonal violence experienced by young athletes reported in the VTAQ. Vertommen *et al.* (2016) used this kind of classification in their study, based on frequency of occurrence and expert classification of items.

6. Conclusion

This research project was part of a larger project aimed at monitoring interpersonal violence against young athletes to support prevention efforts and intervention strategies. To attain these goals, we need effective tools to measure the problem. As Vertommen *et al.* (2016) stated, ‘to foster and support (inter-)national attempts to protect children in organized sports across the world, we need to recurrently perform prevalence surveys using standardized and internationally validated instruments in as many countries as possible’ (p. 234). This reflects concerns in literature about the lack of data in this field (Lang & Hartill, 2015). The VTAQ

is the first validated tool for measuring interpersonal violence against children in sport. This undoubtedly constitutes a major advance in this field, especially because it is based on questioning children directly about their experiences. The VTAQ could serve as a measurement standard for surveys in other countries. Eventually, transcultural validation would allow comparisons between countries about the magnitude of the problem. Finally, the VTAQ could serve as a surveillance tool used in regular time-based intervals to evaluate impacts of prevention and intervention strategies.

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