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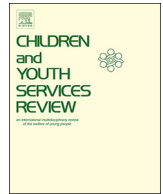
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The effect of a sport-based intervention to prevent juvenile delinquency in at-risk adolescents

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ABSTRACT

Despite the wide implementation of sport-based crime prevention programs, there is a lack of empirical knowledge on the effectiveness of these interventions. This study evaluated a Dutch sport-based program in $N = 368$ youth at risk for juvenile delinquency. Intervention effects were tested in a quasi-experimental study, comparing the intervention group with a comparison group using multiple sources of information. The study was conducted under conditions that resemble real-life implementation, thereby enhancing the relevance of this contribution to practitioners. The primary outcome was juvenile delinquency, measured by official police data. The secondary outcomes were risk and protective factors for delinquency, assessed with self- and teacher reports. A significant effect was found on one delinquency measure. The intervention group consisted of fewer youth with police registrations as a suspect than the comparison group ($d = -0.34$). We did not find an intervention effect on the number of registrations as a suspect in each group. In addition, no significant intervention effects were found on the secondary outcomes. Implications for theory and practice concerning the use of sport-based crime prevention programs are discussed.

1. Introduction

Juvenile delinquency is a problem in today's society, causing considerable financial and societal costs, such as the deployment of the police and justice system, emotional and financial damage to victims, and impact of criminal behavior on offenders and their families (Siegel & Welsh, 2015). In the Netherlands, approximately 34% of the registered suspects of crimes were below the age of 25 in 2014 (CBS, 2015). A meta-analytic review of Assink et al. (2015) showed that once youth committed a crime, they were more likely to develop a persistent pattern of offending. Moreover, juvenile delinquency often goes hand in hand with other undesirable developmental outcomes, including educational dropout, unemployment, and (mental) health and social problems (Kirk & Sampson, 2013; Lanctôt, Cernkovich, & Giordano, 2007). Therefore, preventing juvenile delinquency has become an important topic in youth studies.

Juvenile delinquency is a complex, multifactorial phenomenon, with risk factors in the individual (e.g., impulsiveness and low IQ), family (e.g., child abuse and family disfunction), social (e.g., negative peer influences, school commitment problems), and the community/society domain (e.g., poor housing and low SES; Murray & Farrington, 2010). Youth crime prevention programs consist of a broad spectrum of programs and activities. Many of these programs focus on improving

family functioning, parenting behaviors, social skills, problem behavior, and educational outcomes in youth, generally with small or modest effects on delinquency (De Vries, Hoeve, Assink, Stams, & Asscher, 2015; Lösel & Beelmann, 2003). More recently, youth policy makers have become interested in the use of sports in prevention programs. Sport-based interventions are perceived as low-cost, non-stigmatizing programs that positively influence youth development (Coalter, 2015; Fraser-Thomas, Cote, & Deakin, 2005). Additionally, they are perceived as fun to do and therefore attract (otherwise) difficult to reach target groups (Haudenhuyse, Theeboom, & Nols, 2012). Nowadays, local governments and institutions all over the world are offering youth sports activities to prevent juvenile delinquency (Hartmann, 2003; Kelly, 2013; Nichols, 2007).

The assumption that sport-based interventions prevent juvenile delinquency originates from Hirschi's (1969) theory of social bonds, which claims that individuals with stronger bonds to society are less likely to engage in delinquency, as delinquency may put these valuable bonds at risk. Central to Hirschi's theory are the elements of attachment, commitment, belief, and involvement, and all four elements are supposed to be enhanced by sports participation (Agnew & Petersen, 1989; Spruit, Van Vugt, Van der Put, Van der Stouwe, & Stams, 2016). The *attachment* to significant others may be strengthened by sports participation, as youth become members of a team, generally

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supervised by a coach who is closely related to all members. Further, by participating in sports programs, youth are *committed* to conventional activities. Therefore, they may refrain from deviant acts, as delinquency may compromise their opportunity to participate in these conventional activities. Young athletes may not want to risk the chance of being excluded from the sports field due to delinquent acts. *Beliefs* in society's values may be enhanced by sports participation, because similar rules, norms, and values are being pursued in the sports context. Finally, it is hypothesized that because of their *involvement* in sports, youth are simply too busy to commit delinquent acts (Hirschi, 1969).

Another theory focusing on the social domain of juvenile delinquency is the social vulnerability theory of Vettingburg (1998), which has been applied to the sports context by Haudenhuyse, Theeboom, and Coalter (2012). Social vulnerability theory states that juvenile delinquency arises from distorted and disconnected relations of youth with society. The disconnectedness to society is grounded in the accumulation of negative experiences with institutions of that society (including family, educational, health care, police, and judicial systems), for example by experiencing stigmatization, discrimination, rejection, and lack of opportunities (Vettingburg, 1998). Sport-based interventions could prevent juvenile delinquency by facilitating the social bonding processes and positive learning experiences of youth (Haudenhuyse et al., 2012).

Experiential learning theory, in contrast, addresses juvenile delinquency from an individual perspective in which learning processes within the sports context occur by “doing with reflection” (Newman, Alvarez, & Kim, 2017). Sports participation provides learning opportunities for positive traits, skills, and virtues that protect against the development of delinquent behavior (Holt et al., 2017; Shields & Bredemeier, 1995). By participating in sports activities, youth are expected to learn sportsmanship, morality, obeying rules and authority, self-control, conflict-resolution, skills to cope with disappointments, and to co-operate with others (Shields & Bredemeier, 1995). This learning is facilitated by the coach, who reflects with the youth upon their experiences within the sports context (Newman et al., 2017). Recently, a meta-analytic review found small-to-moderate effects of physical activity and sport-based interventions on adolescent psychosocial functioning, including externalizing problems, internalizing problems, academic achievement, and self-esteem (Spruit, Assink, van Vugt, van der Put, & Stams, 2016). This implies that sport-based interventions can contribute to positive youth development, and therefore, may be promising in preventing juvenile delinquency.

On the other hand, there are indications that sport-based interventions could have an iatrogenic effect. As for all group-based interventions for at-risk youth, sport-based crime prevention programs are vulnerable to increasing anti-social behavior through deviancy training. Deviancy training refers to “the interpersonal dynamic of mutual influence during which youth respond positively to deviant talk and behavior” (Dishion & Tipsord, 2011, p. 189), and is known for its reinforcing effect on delinquency in at-risk peer groups (Dishion & Tipsord, 2011). If peer interactions are not carefully monitored or guided, sport-based crime prevention programs could have a negative effect. In addition, positive effects on behavior within the sports context may not transfer to non-sport settings (Jones, Edwards, Bocarro, Bunds, & Smith, 2017; Turnnidge, Côté, & Hancock, 2014), while this is certainly required for sport-based interventions targeting the prevention of juvenile delinquency. Therefore, it is important to study the effects of sport-based crime prevention.

A number of qualitative and conceptual studies supported the use of sport-based interventions (Hartmann & Depro, 2006; Haudenhuyse, Theeboom, & Coalter, 2012; Kelly, 2011; McMahon & Belur, 2013; Nichols, 2007). These studies were valuable to gain insights into the experiences of youth, understand strength and difficulties in the implementation of sport-based crime prevention, and examine which outcomes are likely to be targeted according to the people involved in the intervention (Haudenhuyse, Theeboom, & Nols, 2012; Holt et al.,

2017; Kelly, 2013; Super, Verkooijen, & Koelen, 2018).

Recently, scholars have emphasized the need for empirical studies to test assumptions of qualitative studies (e.g., the transferability of lessons learnt in the sports context to other settings), to determine the strength of the effects of sport-based interventions, and to compare the effects of different sport-based approaches, and compare them against other crime prevention programs (Chamberlain, 2013; Holt et al., 2017; Inoue, Wegner, Jordan, & Funk, 2015; Jones et al., 2017). Although sport-for-development scholars have correctly observed that (quasi-) experimental studies may not always sufficiently account for wider societal processes (Haudenhuyse, Theeboom, & Coalter, 2012; Kelly, 2011, 2013), which can limit possibilities for experimental control, well-designed (quasi-) experimental designs can test the effects of sport interventions under (clinically representative) real life conditions, ruling out (most) alternative explanations for intervention effects (Shadish, Navarro, Matt, & Phillips, 2000; Weisz, Ugueto, Cheron, & Herren, 2013).

The purpose of the current study was to examine the effects of a sport-based crime prevention program in a real-life setting using multiple sources of information with a quasi-experimental design, thereby enhancing the relevance, generalization, and applicability of the findings. ‘Only You Decide Who You Are’ [*Alleen Jij Bepaalt Wie Je Bent* (AJB)] is a Dutch sport-based intervention providing team sports training at local sports clubs to youth at-risk for developing delinquent behaviors. The primary aim of AJB is to prevent juvenile delinquency by reducing risk factors and increasing protective factors for delinquency. We therefore expected youth participating in AJB to have lower delinquency rates, less risk factors, and more protective factors for juvenile delinquency than youth in the comparison group.

The effect of AJB on the prevention of juvenile delinquency is assessed using official police registration data. In addition, we assessed several secondary outcomes that are known risk and protective factors for juvenile delinquency and that are likely to be targeted by a sport-based intervention. Based on the theoretical foundation of this study (i.e., Hirschi's (1969) social bonds theory, Haudenhuyse, Theeboom, and Nols (2012) social vulnerability theory, and theory of learning opportunities (Holt et al., 2017)), it is expected that especially risk and protective factors from the individual and social domain are relevant in sport-based research. First, *conduct problems*, *aggression*, and *problems with acceptance of authority* are risk factors for juvenile delinquency from the individual domain (Murray & Farrington, 2010), and may be reduced by meaningful and supportive relationships with the coach, and feedback of the coach on behavior of the athletes (Holt et al., 2017; Newman et al., 2017). Second, the involvement with *antisocial peers*, the *experience of peer pressure*, and *lack of resistance to social pressure* are social risk factors for delinquency (Lösel & Farrington, 2012; Murray & Farrington, 2010), which may be reduced when an alternative, prosocial peer network is offered to youth under the guidance of the coach (Holt et al., 2017). Third, *prosocial behaviors* and attitudes are individual protective buffers against juvenile delinquency (Lösel & Farrington, 2012), and may be stimulated by modeling and reinforcement by the coach (Holt et al., 2017). Finally, *academic engagement* is a social protective buffer against juvenile delinquency (Murray & Farrington, 2010). The positive experience within the sports context could restore social bonding to other institutions, including school, causing more commitment to school (Haudenhuyse, Theeboom, & Coalter, 2012).

2. Methods

2.1. Participants

Participants in this study were 368 youth (88.4% male; between 12 and 18 years of age) from 22 different schools, and their teachers. The intervention group consisted of 248 participants, the comparison group of 120 participants. All of the youth in our sample attended the lowest

Table 1
Demographic characteristics of participants.

	Intervention group (n = 247)	Comparison group (n = 116)	Tests of significance of the differences between groups
Sex (%)			$\chi^2 (1) = 0.309$
Male	89.1	87.1	
Female	10.9	12.9	
Age (years)			$t(360) = 2.789^{**}$
Mean	14.51	14.24	
SD	1.05	0.77	
Ethnicity (%)			$\chi^2 (6) = 7.242$
Dutch	19.9	25.2	
Moroccan	23.2	14.8	
Turkish	11.0	13.0	
Surinamese	10.6	15.7	
Antillean	11.0	7.0	
Other Western	5.7	7.0	
Other non-Western	18.7	17.6	
Living situation (%)			$\chi^2 (2) = 1.755$
Two parent family	61.6	59.8	
Single parent family	35.4	39.3	
Other	3.0	0.9	
Type of education (%)			$\chi^2 (1) = 0.123$
Special education	56.3	54.3	
Low level regular education	43.7	45.7	

** $p < .01$.

level of Dutch regular education (lower vocational education), or attended a form of special education for youth with learning disabilities (practical training). Dutch schools for practical training have the following admittance criteria: (1) an IQ between 55 and 85; and (2) learning delays of 50% or more in at least two major subjects (e.g., mathematics or reading comprehension). AJB is targeting male youth from disadvantaged neighborhoods with high crime rates involved in special education or the lowest educational level. In a previous study on this sample, it was concluded that the sample was at risk for delinquency due to elevated levels of conduct problems, aggression, and procriminal attitudes, involvement with delinquent peers, and lower levels of prosocial behavior compared with Dutch norm groups (Reference blinded for peer review).

Table 1 presents the demographic characteristics of the intervention and comparison group. Differences between treatment conditions at T0 on demographic characteristics and outcome variables (see Table 5 for descriptions) were tested with independent samples *t*-tests for continuous variables and chi-square analyses for categorical variables. There were no significant differences on sex, ethnicity, living situation, type of education, police registrations as a suspect, conduct problems, aggression, perceived peer pressure, self-reported resistance to social pressure, academic engagement, and teacher reported prosocial behavior and acceptance of authority. However, there was a significant difference between the intervention and comparison group on age ($M_{\text{AJB}} = 14.51$, $M_{\text{control}} = 14.24$). Because age was significantly correlated with two of our outcome measures ($r = 0.111$ for registrations as a suspect, and $r = -0.137$ for aggression), we chose to control for age in the analyses pertaining to these outcomes. Further, youth in the intervention group reported more prosocial behavior ($d = 0.26$), more acceptance of authority ($d = 0.25$), and to have less delinquent friends ($d = -0.30$). Their teachers reported less resistance to social pressure ($d = 0.27$) on T0 in the experimental group compared to the comparison group.

2.2. Procedure

The intervention group consisted of youth who participated in AJB. Participants from the intervention group were recruited at the AJB-training. The comparison group was composed of youth who attended six of the same schools as the intervention group, but their classes were not offered to participate in AJB. The comparison group was formed in a way that the composition of the comparison group reflected the composition of the intervention group on sex, age, and type of education. The participants from the comparison group were recruited at their school. Because the AJB program was linked to local high schools, the recruitment of the participants of the comparison group and the participating teachers was supported by the school administration. All study participants were asked for consent. Also, their parents were informed about the study, and a passive consent procedure was followed. Three participants were excluded from the study because either they refused to participate themselves or their caregivers did not give consent. Procedures were in line with the ethical rules and guidelines of the Dutch Royal Academic of Science and the University of Amsterdam.

Participants in both conditions, and their teachers, were assessed on three different occasions. For the intervention group, this was at the start of AJB in March 2014 (T0), 6.6 months after the start of the intervention (T1), and 12.9 months after the start of AJB (T2). The measurement occasions of the intervention group took place at the sports clubs. The inclusion of the comparison group ran from March 2014 to September 2014. The comparison group was assessed at school, with the same amount of time between each measurement occasion as the intervention group.

The Dutch Public Prosecution Service gave permission to access official police data. Police registrations were available for the 2 year period before the start of AJB (criminal history) and for the 16.0 months period after the start of AJB (delinquent outcome). All data gathered in this study was anonymized.

2.3. Experimental conditions

2.3.1. Intervention condition

Only you decide who you are [*Alleen jij bepaalt wie je bent* (AJB)] is a sport-based intervention targeting youth at risk for developing delinquent behavior. AJB was developed in a practice setting, by the Dutch Ministry of Security and Justice to prevent juvenile delinquency. Through sports clinics given by professional athletes at selected schools, youth were encouraged to participate in AJB. In AJB, partnerships are created between the schools and the local sports clubs. Each school has a connection with a sports club that offers one type of sports. Partnerships between schools and sports clubs are based on geography (the sports club had to be on biking distance from the school), the type of sports (soccer, basketball, or baseball), and the assessment of the Ministry of Security and Justice if the particular sports club would be an appropriate location for the intervention. Therefore, the youth did not have a choice in the type of sports. If the youth were interested in participating in AJB, they could become a member of the locally partnered sports club. Contribution fees and sports materials were covered by the Ministry of Security and Justice. At the sports clubs, youth participated in (indoor) soccer, baseball, or basketball training in special AJB-teams twice a week. The Ministry of Security and Justice selected the coaches on their ability to act as a role model, and to adequately deal with the characteristics of at-risk youth. For example, coaches did not have criminal antecedents, which was checked. The coaches did not receive any training on how to deliver the AJB intervention. They were informed that they should give regular sports training. During the AJB-training sessions, the coaches had to give specific feedback to behavior of the participants, and had to create an adequate, safe (educational) environment, with positive relationships between the coach and the participants. The coach had to be clear about expected behaviors (i.e., promote prosocial behavior and reject

antisocial behavior), and to set a good example. The participants were approached in a positive, respectful way and were motivated to participate in prosocial activities at the club. If necessary, the trainer provided individual guidance to the participants and discussed concerns about the behavior with the school. AJB-coordinators ensured good coordination between the schools and sport clubs. The duration of the AJB-intervention is one sports season (approximately one year). During the AJB-intervention, the teams consisted only of participants of AJB. At the end of the AJB season, participants were encouraged to join the regular sports teams of the club if their behavior and development allowed this.

2.3.2. Control condition

The comparison group did not receive any specific intervention. However, 65.5% of the comparison group stated that they practiced sports, and 48.3% of the comparison group stated that they were a member of a sports club. This is (slightly) below the national sports participation and sports club membership of 12–20 years old of 80% and 56% respectively (SCP, 2016).

2.4. Attrition and missing values

Intervention attrition was defined as attrition from AJB during the first sports season (the time between T0 and T1). In total, 83 (33.5%) participants dropped out: 9.6% moved to a different city, 12.0% chose to participate in a sports club outside AJB, 9.6% did not have time anymore to participate in AJB, 22.9% lost interest in AJB, 27.7% dropped out because the sports club had stopped with AJB, and 18.1% of the dropouts did not provide a reason for attrition. Dropouts did not differ from non-dropouts on demographic characteristics (sex, age, ethnicity, and living situation), criminal history, or secondary outcomes (conduct problems, aggression, acceptance of authority, friends' participation in delinquent behavior, peer pressure and support for delinquent behavior, resistance to social pressure, prosocial behavior, and academic engagement). We did find a difference between dropouts and non-dropouts on type of education ($\chi^2(1) = 9.089$; $p < .01$). Participants from special schools for practical training were more likely to drop out than participants from the lowest level of regular education (schools for vocational training).

We could obtain official police registration data for 364 (98.9%) participants in the study. With regard to the secondary outcomes assessed with the self- and teacher reports, not all participants could be reached at all measurement occasions, resulting in missing values. At T0, 99.6% ($n = 247$) of the intervention group and 96.7% ($n = 116$) of the comparison group was assessed. At T1, we collected data on 63.8% ($n = 158$) of the participants in the intervention group and on 97.5% ($n = 117$) of the participants in the comparison group. At T2, we retrieved data on 62.5% ($n = 155$) of the intervention group and 90.8% ($n = 109$) of the comparison group.

2.5. Measures

2.5.1. Juvenile delinquency

Juvenile delinquency was assessed using data from official police records. We coded whether the youth were registered as a suspect of a criminal offense within 16.0 months after T0, and the number of offenses for which the youth was registered as a suspect during that period. To control for pre-intervention differences in delinquency, we created criminal history scores. It was coded whether the youth was registered as a suspect of a criminal offense during the two years prior to AJB (prior to T0), and the number of offenses for which the youth was registered as a suspect.

2.6. Secondary outcomes

2.6.1. Conduct problems

Teachers reported on the youth's conduct problems with the use of a subscale of the Dutch version of the Strengths and Difficulties Questionnaire (SDQ; Van Widenfelt, Goedhart, Treffers, & Goodman, 2003). The five items had to be scored on a three point Likert-scale ("not true", "somewhat true", or "certainly true"). Higher scores indicated more conduct problems.

2.6.2. Aggression

Youth reported on their aggressive behaviors using the Overt Aggression scale of the Dutch Adaptation of the Buss-Durkee Hostility Inventory (BDHI-D; Lange, Hoogendorn, Wiederspahn, & de Beurs, 2005). The BDHI-D presents 16 statements that were scored true or false. Higher scores indicated more aggression.

2.6.3. Acceptance of authority

Teachers and youth reported on the youth's ability to accept authority using a subscale of the Dutch Tasks and Skills of Adolescents questionnaire (TVA; Van der Knaap, Beenker, & Bijl, 2004). The seven-item scale assessed how well youth deal with authority. With a five point Likert-scale (ranging from "does not apply to me at all" to "totally applies to me"), the youth answered to what extent a statement applied to them. The teacher scale ranged from "does not apply to X" to "totally applies to X". Higher scores indicated better acceptance of authority.

2.6.4. Friends' participation in delinquent behavior

To assess the involvement with deviant peers, a Dutch six item scale of Megens and Weerman (2010) was used. The youth reported on how many of their friends ("none", "some" or "most or all of them") committed offenses. Higher scores indicated more delinquent friends.

2.6.5. Peer pressure and support for delinquent behavior

Youth reported on perceived peer pressure and support for delinquent behavior by their friends on a Dutch six item scale of Megens and Weerman (2010). Answers were given on a five point Likert-scale, ranging from "completely agree" to "completely disagree". Higher scores indicated that youth experienced more peer pressure.

2.6.6. Resistance to social pressure

The teachers and youth reported on the juvenile's resistance to social pressure using a Dutch four item subscale of the TVA (Van der Knaap et al., 2004). Higher scores indicated more resistance to social pressure.

2.6.7. Prosocial behavior

To assess the level of prosocial behavior, the teachers and youth filled in the Prosocial behavior subscale of the Dutch version of the SDQ (Van Widenfelt et al., 2003). Higher scores indicated more prosocial behavior.

2.6.8. Academic engagement

The teachers and youth reported on the youth's academic engagement using the subscale School attitude of the Dutch TVA (Van der Knaap et al., 2004). Higher scores indicated more academic engagement.

2.6.9. Reliability and validity of scales

Table 2 presents the Cronbach's alpha of each scale for each measurement occasion. The majority of the self-report scales had an acceptable to good internal consistency according to Cicchetti's (1994) rules of thumb. The internal consistency of the teacher reported scales were all good to excellent, according to Cicchetti's (1994). All scales have been previously used with similar samples.

Table 2
Reliability of scales.

Scale	Informant	Example item	T0	T2	T3
			α	α	α
SDQ					
Conduct problems	Teacher	“Often loses temper”	0.80	0.78	0.75
Prosocial behavior	Teacher	“Helpful if someone is hurt, upset or feeling ill”	0.84	0.82	0.86
	Self-report	“I usually share with others”	0.63	0.68	0.68
BDHI-D					
Aggression	Self-report	“If I am angry, I slam with doors”	0.65	0.70	0.69
TVA					
Acceptance authority	Teacher	“X accepts that other people have something to say about him/her”	0.95	0.94	0.95
	Self-report	“I accept that other people have something to say about me”	0.78	0.76	0.82
Resistance to pressure	Teacher	“If a friend tries to convince X to do something he/she does not really want, then he/she refuses it”	0.94	0.89	0.90
	Self-report	“If a friend tries to convince me to do something I do not really want, then I refuse it”	0.81	0.83	0.86
Academic engagement	Teacher	“X makes sure he/she gets to school on time”	0.92	0.91	0.89
	Self-report	“I make sure I get to school on time”	0.83	0.78	0.82
Megens & Weerman					
Friends' delinquency	Self-report	“How many of your friends stole something from a store?”	0.84	0.82	0.89
Peer pressure	Self-report	“My friends made me do things I did not want to do”	0.82	0.83	0.85

Table 3
Descriptions of police registration as a suspect for both groups.

	N	Criminal history ^a		Delinquent outcome ^b	
		%	M (SD)	%	M (SD)
Intervention group	245	15.5	0.23 (0.73)	11.0	0.20 (0.84)
Comparison group	119	10.1	0.15 (0.51)	15.1	0.23 (0.66)

^a Police registrations as a suspect during the two years prior to T0.
^b Police registrations during the 16 months after T0.

2.7. Analyses

To examine the effect of AJB on the primary and secondary outcomes, multilevel analyses with maximum likelihood estimation procedures were performed. In this study, measurement occasions (level 1) were nested within individuals (level 2), who were nested within schools (level 3). Multilevel analyses take into account the dependencies among measurements within respondents, as well as dependencies among participants of the same schools, and have the advantage of using all the available data (including those from participants with missing data; Hox, 2011). The effect of AJB on binary measures of juvenile delinquency (registered as a suspect yes/no) was estimated with a multilevel model for binary distributions (Heck, Thomas, & Tabata, 2013), while controlling for criminal history and age. The effect of AJB on the number of registrations as a suspect was estimated with a multilevel model for negative binomial distributions (i.e., count data; Gardner, Mulvey, & Shaw, 1995), while controlling for criminal history. In both analyses, the group difference was estimated as a fixed effect in a multilevel model that separated variation in delinquency at the within-school level from the between school level.

Table 4
Parameter estimates of the multilevel models concerning the effect of group on juvenile delinquency.

	Registered as suspect (yes/no)						Number of registrations as suspect					
	Est.	SE	t	p ^a	OR	95% CI	Est.	SE	t	p ^a	OR	95% CI
Group ^b	-0.61	0.35	-1.73	0.042	0.542	0.303;0.970	-0.10	0.23	-0.42	0.337	0.907	0.620;1.327
Criminal history	1.86	0.36	5.12	0.000	6.411	3.521;11.628	0.41	0.13	3.13	0.001	1.518	1.218;1.891
Age	0.28	0.18	1.59	0.057	1.327	0.989;1.781	0.02	0.11	0.20	0.839	1.023	0.849;1.233

Note. Bold emphasis: $p < .05$; OR = Odds ratio. Est. = Estimate.

^a One-sided *p*-values.
^b Comparison group = 0; intervention group = 1.

Values of $p < .05$ were considered as statistically significant.

In the multilevel models to measure the effect of AJB on secondary outcomes, Group, Time, and Group * Time effects were estimated with fixed effects, while the variances of individual schools and the within-person variances were modeled with random effects. In the analysis measuring the effect of AJB on aggression, we controlled for age. To prevent the problem of multiple testing (Tabachnik & Fidell, 2013), results for the secondary outcomes were considered significant if $p < .025$. At each measurement occasion, we checked for extreme outliers ($+/- 3.29 SD$ from the mean; Tabachnik & Fidell, 2013) in the continuous outcome variables. The outliers were then brought back to an acceptable value of $+/- 3.29 SD$ from the mean (i.e., winsorizing outliers). All continuous variables (i.e., the secondary outcomes) were transformed into standard normal scores (with an overall mean of 0 and a standard deviation of 1). Using this approach, the parameter estimates can be interpreted as a measure of effect (Cohen's *d* for categorical predictors and correlation coefficient *r* for continuous predictors). All analyses were tested one-sided, except for the tests on T0-differences between intervention and comparison group.

An intention-to-treat analysis (ITT) was employed; that is, all participants who were included in the study at T0 were also included in the analyses, regardless of whether they had dropped out. By performing ITT analysis, we avoided the problem of overestimated effectiveness, which may be created by omitting dropouts (Kruse et al., 2002).

3. Results

3.1. Effects of AJB on juvenile delinquency

Table 3 presents the descriptions of juvenile delinquency prior to T0 (i.e., criminal history) and juvenile delinquency during the 16 months

Table 5
Means and standard deviations of secondary outcomes per group per measurement occasion.

	Informant	AJB						Comparison group					
		T0		T1		T2		T0		T1		T2	
		n	M (SD)	n	M (SD)	n	M (SD)	n	M (SD)	n	M (SD)	n	M (SD)
Conduct problems	Teacher	247	0.51 (0.51)	156	0.37 (0.42)	142	0.26 (0.35)	116	0.47 (0.47)	116	0.37 (0.43)	107	0.33 (0.36)
Aggression	Self-report	241	0.51 (0.19)	154	0.49 (0.21)	130	0.46 (0.21)	114	0.55 (0.19)	108	0.53 (0.20)	101	0.53 (0.20)
Acceptance of authority	Self-report	245	2.68 (0.74)	154	2.87 (0.62)	131	2.94 (0.64)	115	2.49 (0.82)	108	2.66 (0.69)	101	2.66 (0.74)
	Teacher	247	2.56 (0.89)	156	2.68 (0.82)	141	2.85 (0.84)	116	2.61 (0.92)	117	2.78 (0.82)	108	2.89 (0.78)
Friends' delinquent behavior	Self-report	241	0.30 (0.44)	153	0.28 (0.41)	130	0.24 (0.40)	116	0.44 (0.51)	108	0.31 (0.44)	100	0.41 (0.51)
Perceived peer pressure	Self-report	244	1.07 (1.06)	154	0.97 (1.01)	130	0.76 (0.92)	116	1.23 (1.07)	108	0.85 (0.95)	100	0.77 (0.92)
Resistance to pressure	Self-report	246	2.92 (1.06)	150	3.09 (1.04)	131	3.20 (1.03)	116	2.77 (1.11)	108	2.89 (0.96)	100	3.15 (0.86)
	Teacher	235	2.42 (0.90)	148	2.59 (0.76)	136	2.79 (0.72)	114	2.64 (0.82)	113	2.63 (0.78)	106	2.69 (0.77)
Prosocial behavior	Self-report	246	1.58 (0.36)	154	1.67 (0.31)	132	1.76 (0.33)	116	1.49 (0.38)	108	1.57 (0.38)	101	1.63 (0.34)
	Teacher	247	1.40 (0.47)	156	1.47 (0.45)	141	1.53 (0.48)	116	1.43 (0.48)	117	1.51 (0.47)	108	1.55 (0.43)
Academic engagement	Self-report	246	2.99 (0.79)	154	3.17 (0.61)	131	3.14 (0.74)	115	2.97 (0.68)	108	3.08 (0.65)	101	3.07 (0.63)
	Teacher	246	2.62 (0.79)	156	2.77 (0.72)	142	2.81 (0.73)	116	2.72 (0.80)	116	2.83 (0.77)	106	2.87 (0.78)

after T0 (i.e., delinquent outcome). Table 4 shows the results of the multilevel analyses concerning the group effect on delinquent outcomes, while controlling for criminal history and age.

A significant group effect was found on the proportion of youth that was registered as a suspect, while controlling for criminal history and age. The intervention group had a significantly lower chance of being registered as a suspect than the comparison group ($OR = 0.542$; $d = -0.34$), which means that the comparison group was 1.845 times more likely to be registered as a suspect than the intervention group. In the intervention group, 11.8% showed a reduction in suspect registration, 81.2% did not show a change in suspect registration, and 6.9% showed an increase in suspect registration. For the comparison group this was 6.7%, 82.4% and 10.9% respectively. We did not find a significant group effect for the number of registrations as a suspect, while controlling for criminal history and age.

3.2. Effects of AJB on risk and protective factors of juvenile delinquency

Table 5 presents the mean scores and standard deviations per group on each secondary outcome variable on all measurement occasions. See Fig. 1 for the developmental paths over time for both groups. Table 6 shows the results of the multilevel analyses concerning Time, Group, and Group * Time interactions on the secondary outcomes. The Group * Time interactions can be interpreted as the effect of AJB.

None of the Group * Time interactions were significant, indicating that AJB had no significant effect on the secondary outcomes. In some

of the secondary outcomes, significant Time effects were found. The total group showed significant reductions in perceived peer pressure over the course of T0-T1 ($d = -0.38$), and T0-T2 ($d = -0.46$). For T0-T2, significant improvements were reported by the total group ($d = 0.36$) on resistance to social pressure. Furthermore, we found significant improvement of prosocial behavior over time ($d_{T0-T2} = 0.40$) in the self-reports. Finally, in some of the secondary outcomes, we found Group effects. The intervention group reported higher levels of acceptance of authority across the measurement occasions than the comparison group ($d = 0.28$). There was also a significant Group effect on friend's delinquent behavior ($d = -0.31$) and self-reported prosocial behavior ($d = 0.31$), indicating that across assessments, the intervention group reported fewer delinquent friends and more prosocial behavior than the comparison group.

4. Discussion

Sport-based crime prevention programs are widely implemented by local governments and institutions all over the world (Armour, Sandford, & Duncombe, 2013; Kelly, 2013; Nichols, 2007). This was the first quasi-experimental study to assess the effect of a sport-based intervention on official police registration data and associated outcomes, which was conducted under real-life conditions, using multiple sources of information. AJB is a Dutch sport-based crime prevention program for youth at risk for developing delinquent behaviors. During the 16 months after the start of AJB, an effect of AJB on juvenile

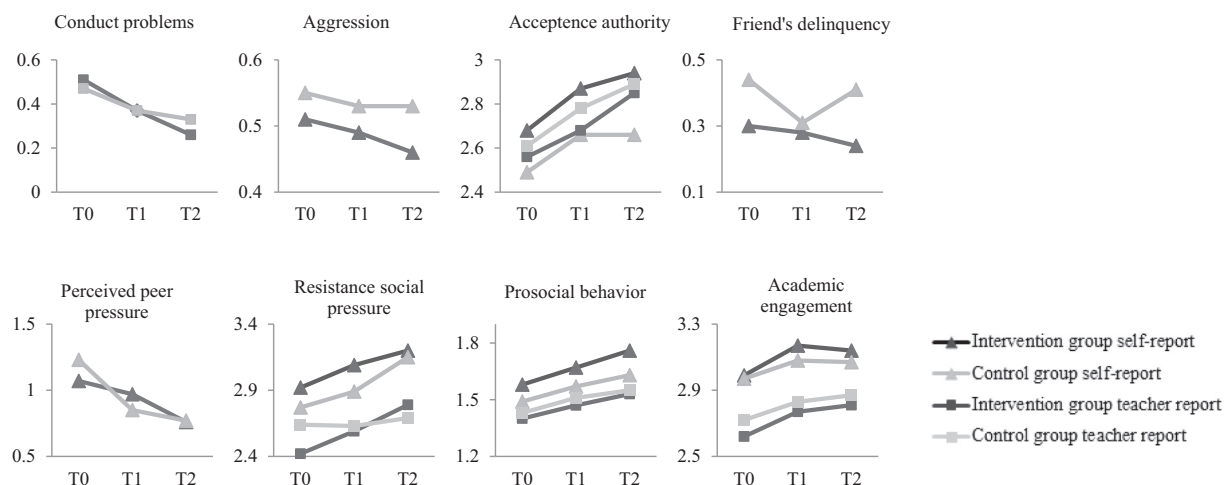


Fig. 1. Development over Time for Secondary Outcomes per Group.

Table 6
Parameter estimates^a of the multilevel models ofwhi the effects of time, group, and interactions between time and group on secondary outcomes.

	Conduct problems				Aggression				Acceptance of authority							
	Teacher report				Self-report				Self-report				Teacher report			
	Estimate	SE	t	p	Estimate	SE	t	p	Estimate	SE	t	p	Estimate	SE	t	p
T0-T1	-0.23	0.19	-1.21	0.118	-0.10	0.13	-0.73	0.233	0.23	0.13	1.75	0.040	0.27	0.22	1.21	0.118
T0-T2	-0.32	0.19	-1.68	0.052	-0.13	0.13	-0.97	0.167	0.23	0.14	1.73	0.042	0.36	0.22	1.62	0.058
Group ^b	-0.07	0.17	-0.40	0.346	-0.11	0.11	-0.94	0.174	0.28	0.12	2.27	0.012	0.14	0.20	0.74	0.233
T0-T1 * Group	-0.06	0.24	-0.24	0.405	-0.03	0.17	-0.19	0.425	0.05	0.16	0.29	0.386	-0.13	0.27	-0.49	0.684
T0-T2 * Group	-0.23	0.23	-1.02	0.157	-0.12	0.17	-0.72	0.236	0.14	0.17	0.83	0.203	-0.02	0.27	-0.09	0.533
Age	-	-	-	-	-0.20	0.04	-2.57	0.005	-	-	-	-	-	-	-	-

	Friends' delinquent behavior				Perceived peer pressure				Resistance to social pressure							
	Self-report				Self-report				Self-report				Teacher report			
	Estimate	SE	t	p	Estimate	SE	t	p	Estimate	SE	t	p	Estimate	SE	t	p
T0-T1	-0.30	0.16	-1.89	0.036	-0.38	0.13	-2.90	0.002	0.12	0.13	0.89	0.188	0.05	0.24	0.20	0.422
T0-T2	-0.07	0.16	-0.43	0.337	-0.46	0.13	-3.53	0.000	0.36	0.13	2.74	0.003	0.12	0.23	0.54	0.298
Group ^b	-0.31	0.14	-2.18	0.018	-0.09	0.12	-0.76	0.224	0.15	0.12	1.20	0.115	-0.14	0.21	-0.65	0.261
T0-T1 * Group	0.24	0.19	1.22	0.884	0.16	0.17	0.98	0.834	0.05	0.17	0.27	0.395	0.21	0.29	0.72	0.238
T0-T2 * Group	-0.09	0.20	-0.43	0.336	0.29	0.17	1.77	0.960	-0.08	0.17	-0.47	0.681	0.35	0.28	1.27	0.106

	Prosocial behavior				Academic engagement											
	Self-report				Teacher report				Self-report				Teacher report			
	Estimate	SE	t	p	Estimate	SE	t	p	Estimate	SE	t	p	Estimate	SE	t	p
T0-T1	0.24	0.15	1.63	0.062	0.23	0.21	1.09	0.142	0.16	0.13	1.21	0.115	0.15	0.21	0.72	0.240
T0-T2	0.40	0.15	2.71	0.008	0.31	0.21	1.51	0.071	0.15	0.14	1.06	0.144	0.20	0.20	0.97	0.171
Group ^b	0.31	0.13	2.29	0.016	0.20	0.19	1.07	0.146	0.03	0.13	0.27	0.396	0.05	0.18	0.25	0.404
T0-T1 * Group	-0.01	0.18	-0.08	0.531	-0.11	0.25	-0.43	0.664	0.12	0.16	0.74	0.230	0.06	0.25	0.24	0.404
T0-T2 * Group	0.09	0.19	0.49	0.313	-0.04	0.25	-0.14	0.556	0.09	0.18	0.49	0.310	0.07	0.25	0.27	0.395

Note. Bold emphasis: $p < .025$.

^a Parameter estimates (while controlling for the effects of other parameters) can be interpreted as effect sizes (Cohen's d for dichotomous variables and r for continuous variables).

^b Comparison group = 0; intervention group = .

delinquency was found. Youth in the intervention group were less registered as a suspect in the police records than the comparison group ($d = -0.34$). There was no effect on the mean number of registrations as a suspect. The total sample showed improvements on some risk and protective factors for juvenile delinquency. However, no significant intervention effects of AJB were found on the secondary outcomes.

Although we did find a positive effect of AJB on the delinquency outcome, we conclude that overall the effects of AJB are small. This was not in line with expectations that arose from non-experimental studies on the effects of sport-based crime prevention programs (Hartmann & Depro, 2006; McMahan & Belur, 2013; Nichols, 2007), and research on the effects of sport-based interventions on developmental outcomes in adolescents (Spruit, Assink, et al., 2016). On the other hand, a recent meta-analysis of 51 studies on the relation between sports participation and juvenile delinquency did not find a significant relation between these two constructs (Spruit, Van Vugt, et al., 2016). Scholars have concluded that sport by itself is not enough to prevent juvenile delinquency, but that the effects of sport-based interventions depend on contextual factors, such as the type of sports, the educational and moral quality of the sports environment, and the educational qualities of coaches (Côté & Gilbert, 2009; Hartmann, 2003; Haudenhuyse, Theeboom, & Nols, 2012; Ntoumanis, Taylor, & Thøgersen-Ntoumani, 2012). For instance, Rutten et al. (2007) showed that higher quality coach-athlete relationships and better moral atmosphere in teams were related to reduced levels of antisocial behavior and higher levels of prosocial behavior in adolescent athletes. Hartmann (2003, p. 134) aptly stated: “the success of any sport-based social interventionist

program is largely determined by the strength of its non-sport components”.

Previous research on AJB showed that those contextual, non-sport factors varied across the different teams of AJB (Spruit, van der Put, Van Vugt, & Stams, 2018). For example, basketball coaches showed more adequate behaviors towards the youth, including offering more behavioral structuring, feedback and individual guidance, and made more efforts to enhance the motivation of youth compared to soccer coaches. Moreover, within basketball teams, there was a more positive socio-moral atmosphere (Spruit et al., 2018). Specific coaching behaviors and the quality of the socio-moral atmosphere were also predictive of the development of youth over the course of AJB. More adequate coaching behaviors and a more positive socio-moral atmosphere were related to larger improvement on various outcomes, including conduct problems, aggression, the engagement of delinquent friends, prosocial behavior, and academic engagement (Spruit et al., 2018). Thus, at the group level, the effects of AJB may be limited due to varying intervention quality or treatment integrity across teams (Goense, Assink, Stams, Boendermaker, & Hoeve, 2016) and low susceptibility of a large number of participants for this particular intervention, whereas at the individual level some positive changes may have occurred for a small number of participants.

The lack of intervention effects on the risk and protective factors for juvenile delinquency was unexpected. When inspecting the effect sizes of the intervention effects on the secondary outcomes, we noticed small, but non-significant effects on several outcomes, such as conduct problems, acceptance of authority and resistance to social pressure.

Notably, the current study lacked sufficient power to detect small intervention effects on the individual secondary outcomes. Although the intervention effects on the secondary outcomes were not statistically significant, they might be meaningful in practice (Verdam, Oort, Mirjam, & Sprangers, 2014). The combination of these small effects could have had a cumulative effect on reducing the risk of developing delinquent behaviors, explaining why significant intervention effects were found on delinquent outcomes, but not on the individual risk and protective factors for delinquency. The risk and protective factors for juvenile delinquency may therefore not be perceived as independent influences on delinquency, but in line with systems theory, as “simultaneously occurring, mutually influential, and interrelated phenomena” (Schoenwald & Rowland, 2002, p. 95).

In evaluating the significance of the findings of the current study, it is important to consider limitations of the present study. The first limitation that needs to be mentioned is that participants were not randomly allocated to the experimental and comparison group. It is therefore possible that unobserved differences between the intervention and comparison group existed at the start of the study that may have influenced the results (White, 2010). However, we statistically controlled for potential confounders (including age and initial baseline differences on the outcome variables). Moreover, our study was conducted under conditions resembling real-life implication, using multiple sources of information, which strengthens the validity of our study results (Shadish et al., 2000).

A second weakness of the study was the selective drop-out in the intervention group, and the missing values associated with dropout on the secondary outcomes. Participants from special education classes (schools for practical training for youth with learning disabilities) were more likely to dropout from AJB than participants from regular education classes (lower vocational training). Learning disabilities are associated with all sorts of psychological, social, and health issues, including social information processing difficulties and obesity (Emerson & Hatton, 2007; Ouellette-Kuntz, 2005). Possibly, the social sports environment was too complex for some of the youth, they may have lacked motivation due to physical issues, or may have been deprived of a supporting social network. Drop-out may form a threat to the internal validity of the study when youth with the most severe problems drop out the intervention group, while similar youth were still included in the comparison group. On the other hand, we could obtain police registration data of 98.9% of the participants in the study, including the drop-outs. Therefore, the issue on the missing values is only a potential problem for the secondary outcomes.

Third, participants in the comparison group attended the same schools, or in some cases, even the same classes as the intervention group. While this increased the comparability between the groups, it might have suppressed the estimated intervention effect due to transference (Shadish, Cook, & Campbell, 2002). Although the comparison group did not participate in AJB, it cannot be ruled out that they indirectly benefitted from the intervention through improved school climate and more positive peer interactions (Dishion & Tipsord, 2011; Wissink et al., 2014). Over the course of T0-T2, the intervention group showed significant improvements on conduct problems ($d = -0.53$), aggression ($d = -0.24$), acceptance of authority ($d_{\text{self}} = 0.40$, $d_{\text{teacher}} = 0.38$), perceived peer pressure ($d = -0.30$), resistance to social pressure ($d_{\text{self}} = 0.27$, $d_{\text{teacher}} = 0.49$), prosocial behavior ($d_{\text{self}} = 0.49$, $d_{\text{teacher}} = 0.28$), and academic engagement behavior ($d_{\text{self}} = 0.22$, $d_{\text{teacher}} = 0.30$). This argument offers an explanation for the lack of intervention effects on secondary outcomes in the current study.

Finally, no exclusion criteria were formulated, which means that half of the youth in the comparison group also participated in after-school sports activities. Because of this, the current study evaluated the effect of the specific sport-based intervention, and not so much the effect of sports participation in general. In addition, we tested whether AJB contributed to crime prevention in addition to all the other

activities that are available to youth. However, there is a similarity between sports participation in general and participating in a sport-based intervention (although AJB made several efforts to elevate the pedagogical quality in comparison to regular sports participation), which may explain the absence of intervention effects on the secondary outcomes. Post-hoc analyses on the delinquency outcome suggest that intervention effects may have been suppressed. In the comparison group, a significantly larger percentage of non-athlete youth from the comparison group were registered as a suspect compared to youth in the intervention group (OR = 2.857, p -two-sided = 0.015), while controlling for criminal history and age. Youth in the comparison group who did participate in sports showed no significant difference compared to youth in the intervention group (OR = 1.384, p -two-sided = 0.496).

Despite of the limitations, the current study yields important recommendations for future research and practice concerning sport-based crime prevention programs. Future research may study the effects of sport-based crime prevention programs in other target groups. The current sample consisted of youth at risk for developing delinquent behavior, with an overrepresentation of boys. The results of this study cannot be easily generalized to other target groups. For example, youth who already have a criminal record and show more persistent delinquent behaviors suffer from more severe problems on multiple domains (Assink et al., 2015). Youth with a higher risk of recidivism and with more criminogenic needs should receive more intensive treatment than low risk youth (Andrews & Bonta, 2010), and future research should examine whether there is a role of sport-based interventions in high risk populations. Moreover, future research should assess the effects of sport-based crime prevention in girls. From a risk factor perspective, delinquent behaviors of girls are most strongly predicted by risk factors from the family domain (Van der Put et al., 2014). Taking into consideration that sport-based interventions mainly target risk and protective factors from the individual and social domain, we need to critically examine the potential of sport-based crime prevention for girls.

Further, to fully understand the potential effects of sport-based crime prevention programs, more research should be conducted, in particular under conditions that are representative for real-life practice. We emphasize the need for high quality research designs that incorporate measures of the sports context, such as behaviors of the coach, characteristics of the coach-athlete relationship, and socio-moral climate indicators, in order to understand what is happening on the field and how it is contributing to the effects of the intervention. More research is necessary to deepen our understanding of for whom, how, and when sport-based crime prevention is most likely to be effective. Additionally, more insight into the mechanisms of change underlying the positive effect on juvenile delinquency of AJB, and sport-based crime prevention programs in general, is needed (Kazdin & Nock, 2003). Because we did not find significant intervention effects on the secondary outcomes, a full understanding of why sport-based interventions could be effective in preventing juvenile delinquency is absent. Conceptual and qualitative studies directed us to potential mechanisms of change, but these assumptions need to be empirically tested. Future research (with mediation analysis for example) into mechanisms of change in sport-based interventions may provide important knowledge on why sport-based interventions could be effective in preventing juvenile delinquency and increase the potential effects of sport-based interventions.

Several recommendations for sport-based practice can be made based on the current study. Even though we did find a small, significant effect of AJB on delinquency, overall, the effects of AJB were very modest. We emphasize, in line with other scholars (Coakley, 2011; Coalter, 2015), that the widespread implementation of sport-based crime prevention programs, without a careful theoretical foundation and design that makes it plausible that program goals are achieved, should be followed critically. Sport-based crime prevention in general does not constitute a well described, protocolled practice (Coalter,

2015; Nichols, 2007), and it could be argued that this should be considered a strength of sport-based interventions, because it leaves space for creativity and adjustment to the individual needs of youth. However, without a careful design and implementation, it is rather unclear what is happening on the sports field, what kind of educational techniques are used by the coach to influence behavior, what the educational policies are for dealing with problematic behaviors, and why sport-based interventions may be effective, also referred to as the “black box” of sport-based interventions (Haudenhuyse, Theeboom, & Coalter, 2012; Moreau et al., 2018). Therefore, when interpreting the results of the current study, the study of Spruit and colleagues (2018) that assessed the specific characteristics of AJB and the relation to change should be taken into consideration, and caution is needed in generalizing the results of the current study to other sport-based crime prevention programs.

Important recommendations for the development and implementation of sport-based crime prevention programs can be made. In the local practice of designing and implementing sport-based interventions, policy makers should avoid to copy sports activities for leisure purposes into a frame of sport-based interventions for crime prevention. To date, there are useful guidelines available that should be carefully consulted in the development and implementation of effective sport-based crime prevention programs (see Armour et al., 2013; Coalter, 2013; Haudenhuyse, Theeboom, & Nols, 2012; Kelly, 2011). It goes beyond the scope of this study to provide a full summary of this work, but we will highlight an interesting consideration. For example, meeting the required conditions for effective sport-based interventions (e.g., positive relationship between peers and coaches, adequate socio-moral environment, pedagogical coaching behaviors) demands a lot of interpersonal skills, pedagogical knowledge and competence of the coach (Coakley, 2011; Côté & Gilbert, 2009). Policy makers should question if sports coaches are capable to meet these high standards, and what they need in guidance and training. Haudenhuyse, Theeboom, and Coalter (2012) reported on an interesting, ongoing discussion on whether it “would be easier and more effective for youth workers to learn sports skills than it is for sports coaches to learn the skills of a youth worker”. This question had not been answered yet, but it is important for sport-based interventions to have a clear view on the desired profile of the coaches.

5. Conclusions

In the current study, we have found small but significant intervention effects of AJB on juvenile delinquency, and no effects on the risk and protective factors of juvenile delinquency. It implicates the potential of sport-based crime prevention, but also shows that more research is necessary to truly understand and test the mechanisms of change that are expected from theoretical frameworks. Future research should incorporate measures of the sports context to understand what is happening on the sports field, and how it contributes to the effectiveness of the intervention. In addition, non-sport measures need to be included to test what has changed in the lives of participating youth, and if and why this is linked to a reduction of juvenile delinquency. Because sports participation itself is not enough to prevent youth from engaging in criminal behavior, developers of sport-based interventions should carefully follow science-based recommendations to lift “*sport for fun*” to “*sport for development*”.

Declarations of interest

None.

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