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Research paper

A sport-for-protection program reduces anxiety and depression in youth affected by displacement: A randomized controlled trial of the Game Connect program in Uganda

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ABSTRACT

Introduction: Youth affected by displacement are at risk for anxiety and depression. Supervised sport programs are a potentially effective strategy, however trials from displacement contexts are lacking.
Methods: Displaced youth and youth from host communities in five humanitarian settings across Uganda aged 15 to 24 years, and with at least mild anxiety and/or depression, were randomized to a 16-week sport-for-protection program or a wait-list control condition. The Generalized Anxiety Disorder-7 (GAD-7) and Patient Health Questionnaire-9, adolescent version (PHQ-9-A) were assessed pre- and post-intervention. Linear mixed modelling was conducted.
Results: 834 young people were randomized (421 in the experimental and 413 in the control condition; median age = 19.0 years; 46.9 % boys; 14.7 % with self-reported or observed disability; 29.5 % from host community and 70.5 % displaced youth). Large effect sizes were found for the anxiolytic (Cohen d = 1.21, 95%CI = 1.06–1.36) and antidepressant (Cohen d = 1.32, 95%CI = 1.17–1.47) effects of sport-for-protection in comparison with a wait-list control condition. In subgroup analyses, large effect sizes were observed in displaced youth (Cohen d GAD-7 = 1.15, 95%CI = 1.0–1.32; Cohen d PHQ-9-A = 1.33, 95%CI = 1.16–1.51) and youth from host communities (Cohen d GAD-7 = 1.34, 95%CI = 1.06–1.61; Cohen d PHQ-9-A = 1.30, 95%CI = 1.03–1.58); in boys (Cohen d GAD-7 = 1.23, 95%CI = 1.03–1.43; Cohen d PHQ-9-A = 1.36, 95%CI = 1.14–1.58) and girls (Cohen d GAD-7 = 1.11, 95%CI = 0.89–1.33; Cohen d PHQ-9-A = 1.26, 95%CI = 1.05–1.47); and in those with (Cohen d GAD-7 = 0.99, 95%CI = 0.61–1.37.; Cohen d PHQ-9-A = 1.53, 95%CI = 1.12–1.94) and without disability (Cohen d GAD-7 = 1.24, 95%CI = 1.08–1.49; Cohen d PHQ-9-A = 1.28, 95%CI = 1.12–1.44).
Conclusion: Sport-for-protection is an effective stand-alone or adjunctive intervention to reduce symptoms of anxiety and depression among young people affected by displacement within humanitarian settings.

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1. Introduction

Displacement of young people in regions of conflict and instability represents a profound humanitarian challenge with far-reaching implications for mental health (Patanè et al., 2022). Amidst the adversity of displacement, young people encounter a myriad of stressors, including trauma, loss, uncertainty, and social isolation (International, Society for Social Pediatrics and Child Health, ISSOP Migration Working Group, 2018). In the face of such challenges, understanding and addressing the factors that reduce the mental health consequences among this population is of paramount importance (Tol et al., 2023).

Physical activity defined as "people moving, acting, and performing within culturally specific spaces and context" (Piggin, 2020) has emerged as a target for reducing the mental health burden among young people. It can take various forms with different intensities, ranging from active commuting to leisure time and occupational activities and to sport, the latter governed by a set of rules and customs (Caspersen et al., 1985). Engaging in regular physical activity has the potential to improve overall mood, self-esteem, and quality of life in adolescents and young adults (Purgato et al., 2024), while at the same time reducing symptoms of depression (Heissel et al., 2023; Li et al., 2023; Recchia et al., 2023), anxiety (Carter et al., 2021; Ramos-Sanchez et al., 2021), and post-traumatic stress (Ramos-Sanchez et al., 2021; Martinez-Calderon et al., 2024). Moreover, physical activity offers a unique opportunity for social interaction, skill-building, and empowerment (Purgato et al., 2024), all of which are crucial elements for strengthening psychosocial resilience in late adolescence and early adulthood (Davydov et al., 2010; Helmreich et al., 2017).

The evidence for the importance of physical activity in reducing the mental health burden among adolescents and young adults is however mainly derived from studies in high-resource settings (van Sluijs et al., 2021). Rigorous evidence based on randomized controlled trials investigating the mental health effects of physical activity from lower resourced humanitarian settings and focusing on young people affected by displacement is currently lacking (Rosenbaum et al., 2021). Investigating the effectiveness of physical activity on reducing the mental health burden in youth living within humanitarian settings is important as these settings face numerous challenges, including a lack of appropriate infrastructure and accessibility to recreational facilities, and staff who have received limited training (Komakech et al., 2023). Investigating the effectiveness of physical activity in young people aged 15 to 24 years is particularly important since it is a critical life stage in the development of healthy behaviors and consequently the risk for cardiometabolic and mental health disorders later in life (van Sluijs et al., 2021).

While numerous humanitarian actors including the United Nations High Commissioner for Refugees (UNHCR), the International Olympic Committee (IOC) and Terre des Hommes (TdH) (UNHCR et al., 2018), the International Organization for Migration (IOM) (IOM, 2019) and the International Federation of Red Cross and Red Crescent Societies Reference Centre for Psychosocial Support (2014) have published guidance documents around the delivery of sport and physical activity in humanitarian settings, robust evaluation of the mental health effects of such approaches in these settings is lacking. To address this gap, the current randomized controlled trial aims to investigate the effects of a 16-week (13 sessions) sport-for-protection intervention of 2 h on symptoms of anxiety and depression in young people affected by displacement. Participants were both young refugees and youth from the host-community, aged 15 to 24 years with mild to moderate anxiety and/or depression within humanitarian settings across Uganda. Sport-for-protection can be defined as an approach that uses sport as a tool to achieve protection outcomes for participants including social inclusion, social cohesion and psychosocial well-being (UNHCR et al., 2018).

We targeted young people aged 15 to 24 years with at least mild symptoms of anxiety and/or depression within the host communities as well. Research indicates that in host communities where displaced youth reside, there is a notable correlation with mental health challenges among both displaced and host community youth (Miller and Rasmussen, 2010). Factors such as increased social and economic strain, limited access to resources, cultural conflicts, and disrupted social networks contribute to heightened stress levels and psychological distress among all youth involved (Maystadt and Verwimp, 2014). Moreover, the psychological impact of witnessing or experiencing displacement-related trauma, coupled with the strain on local services and infrastructure, exacerbates the vulnerability of both displaced and host community youth to mental health issues (Kreibaum, 2016). Recognizing the interconnectedness of their experiences underscores the necessity for holistic support systems and interventions tailored to address the diverse needs of all youth within these communities. Special attention should also be given to needs of youth with disabilities since displacement often exacerbates vulnerabilities, and individuals with disabilities face heightened barriers to accessing essential services (Bolton et al., 2023). By integrating considerations of disability status into program planning, practitioners can ensure inclusivity and equitable access to physical activity, promoting psychological well-being and social integration among displaced youth. Similarly, integrating sex considerations into sport and physical activity programming for displaced youth in humanitarian settings is essential to address the unique needs, preferences, and barriers faced by girls and boys, promoting inclusive and equitable access (Blanchet et al., 2017). In this study, we will explore whether a sport-for-protection intervention aiming to create a physically and psychologically safe, supportive and inclusive environment for all involved reduces the mental health burden (i.e. symptoms of anxiety and depression) in youth with a disability and in both boys and girls and residing in humanitarian settings across Uganda.

Uganda is, in particular, of interest as a study setting since it is Africa's largest refugee host, providing refuge to over 1.6 million people (UNHCR, 2024). Most refugees come from South Sudan, the Democratic Republic of the Congo, Somalia, and Burundi (UNHCR, 2024). In total, 57 % of displaced people are younger than 18 years and 24 % are between the age of 15 and 24 years (UNHCR, 2024).

We hypothesize that the 16-week sport-for-protection program reduces symptoms of anxiety and depression among displaced young people and young people from the host communities aged 15 to 24 years with at least mild anxiety and/or depression and irrespective of the presence of disability or not, and their sex (boys vs. girls) and legal (i.e. host vs. displaced) status.

2. Material and methods

2.1. Design

Reporting of this randomized controlled trial adheres to the Consolidated Standards of Reporting Trials (CONSORT) checklist (Schultz et al., 2010) and has been registered retrospectively in ClinicalTrials.gov (Identifier: NCT 06464627).

2.2. Sample size calculation

The minimum sample size of 350 participants per arm (total = 700) to reach sufficient power was determined through a power analysis using G-Power 3.1.9.7. The smallest post-treatment effect size for either anxiety or depression of exercise versus treatment-as-usual or waiting list as control conditions in adolescents and/or young adults reported in earlier meta-analyses of controlled trials (Wang et al., 2022; Axelsdóttir et al., 2021; Carter et al., 2021; Wegner et al., 2020; Bailey et al., 2018; Larun et al., 2006) was Cohen's d = − 0.48 for depressive symptoms (Wegner et al., 2020). However, this moderate effect size was based on studies in adolescents from high-income countries. We, therefore, decided to use a smaller effect size, i.e. -0.24, considering incorporating exercise as treatment for children and adolescents in low-income countries (Barbosa Filho et al., 2016), and in particular in refugee

settings (Knappe et al., 2019a, 2019b) is much more challenging. This effect size is also more in line with more recently available effect sizes, e.g. Hedges' g = −0.29 (Recchia et al., 2023) demonstrating the antidepressant effects of exercise in children and adolescents. We assumed a two-sided *t*-test, alpha level of 0.01, test power of 80 % based on 1:1 allocation (equal group size). A dropout rate of about 25 % ($n = 175$) was anticipated based on a previous physical activity feasibility study in displaced youth (Knappe et al., 2019a, 2019b). Therefore, we aimed to recruit 875 participants.

2.3. Setting, participants and procedure

In 2020, the Olympic Refuge Foundation (ORF) initiated Game Connect, a sport-for-protection program in Uganda. The current study lasted from September 2022 to July 2023. The program was implemented by non-governmental organizations (NGOs) led by the AVSI Foundation in consortium with Right to Play, Youth Sport Uganda, the Uganda Olympic Committee, and UNHCR with support from the ORF. Included districts were Kampala, Adjumani, Kikuube, Lamwo, and Kamwenge as (a) they host large refugee settlements, (b) the consortium was already operational in these districts, and (c) existing psychosocial services were considered poor. Surrounding host communities were also included. For the current study, a total of 1912 potential villages that could be targeted, were identified based on (a) the administrative unit list of local district authorities, and (b) the settlement lists of the Department of Refugee Management of the Office of the Prime Minister and UNHCR. Villages are closely-knit communities consisting of a small number of households where social interactions and cooperation are common. They often share resources like water sources, grazing lands, and communal facilities. Villages with the largest population of youth were prioritized. The host community sub-counties were selected based on their proximity to the refugee settlements. Some villages were grouped in clusters. The decision to cluster villages was influenced by the proximity of households to each other despite living in different villages. In total, 869 villages out of the 1912 were at random selected for inclusion in the program, i.e. 705 in Kampala, 53 in Adjumani, 35 in Kikuube, 48 in Lamwo, and 28 in Kamwenge. Following selection of the villages, all youth in selected villages were identified by the research team. Eligible participants in the selected 869 villages of the five catchment areas were: (a) young displaced or host-community adolescents and young adults aged 15 to 24 years, and (b) at least mild symptoms of anxiety and/or depression, defined as a Patient Health Questionnaire −9, adolescent version (PHQ-9-A) (Spitzer et al., 1999) and/or the Generalized Anxiety Disorder-7 (GAD-7) (Spitzer et al., 2006) score of 5 or higher. Those with severe depression (PHQ-9-A $\geq$ 20) and/or anxiety (GAD-7 $\geq$ 15) were eligible to participate, but at the same time referred to local services for specialized support. A list of eligible young people was generated and young people were at random (via randomizer.org) allocated to either 16 weeks of sport-for-protection or to 16 weeks in a waiting control condition by an independent statistician. All participants completed at baseline and immediately post-intervention the interviewer-administered PHQ-9-A (Spitzer et al., 1999) and GAD-7 (Spitzer et al., 2006). An independent team of research assistants performed the interviews to minimize potential bias. Interviews were performed at the homes of the participants. The research assistants were recruited locally from refugee settlements and surrounding host communities and received a 2-day data collection techniques training course including theoretical and practical sessions with role playing. Data collection tools were pretested to ensure coherence and understandability of questions before the actual data collection commenced. Ethical approval was obtained from the Makerere University School of Social Sciences Research Ethics Committee (reference number: MAKSSREC 10.2023.602) and the Uganda National Council for Science and Technology (reference number: SS2703ES). Informed written assent was obtained from all participants. Consent was secured from the current caregivers of youths aged 15–17 years.

2.4. Intervention

The intervention was developed by the consortium and consisted of a facilitator guide including 63 sport-based activities/games organized into 13 categories of life skills (see online only supplement 1 for a summary). Each sport-for-protection session had at least one life skill as a main focus. Therefore, in total 13 sessions were organized over a period of 16 weeks. Additional information about (a) the content and different life skills categories, (b) examples of activities, and (c) background information about the entire Game Connect project is provided in online only supplement 1, 2 and 3 respectively. Timing of the sessions was agreed upon with the young participants. Sessions lasted 2 h and took place in a safe space. Evaluation criteria for safe spaces included proximity to settlements, accessibility, the presence of water, sanitation, and hygiene (WASH) facilities, participant perceptions of the venue, and ownership or access rights. Sport-for-protection activities in these safe spaces were performed in groups comprising an average of 25 young people. Groups were formed based on key unifiers such as age (15 to 19 vs. 20 to 24), location proximity, and other characteristics for example young mothers, in and out of school young people. Additionally, grouping was inclusive with a mix of males and females and youth with disability. Coaches were assigned groups with a coach to youth group ratio of 1:4. Coaches required an educational background in social work or experience in leading sport, sport-for-protection or other youth activities, as well as basic English literacy and digital literacy skills (reading and writing and use of mobile phones) and ability to speak the native and/or other spoken languages in their area of operation. Male and female coaches as well as coaches from both refugee and host community backgrounds were trained during an intensive eight-day training workshop delivered in their area of operation. The training covered the theory and practice of the sport-for-protection curriculum including how to engage young people, safeguarding, physical and psychological first aid, and Olympic Values (i.e. excellence, friendship, respect). Settlement protection and mental health and psychosocial support (MHPSS) service providers were included in the training to support the embedding of the program within the local humanitarian response. Each coach received ongoing supervision from the program manager and local programme coordinators and regular refresher courses. Peer-to-peer coach support, a community of practice to share learning across regions, and a coach self-care program were set up. To promote sustainability, the trained coaches identified peer leaders from within their groups who had shown dedication, leadership skills, interest and knowledge of the sport and life-skills during the first sport-for-protection sessions. More information about the training of the coaches and peer leaders can be found online only supplement 2. The curriculum was pilot-tested for one year after which the participants, parents and caregivers, coaches, and other stakeholders provided feedback following which the culture-sensitivity of the program was improved including activities recognizable to both the host and displaced communities. In order to maximize adherence to the program, coaches worked together with MHPSS and other service providers in all locations. Participants with severe symptoms were referred for specialized MHPSS services and those with other specific needs to non-specialized education, or health services. Through home visits, coaches were able to follow up with those who were missing any sessions and help reduce barriers to access, support with off-field protection issues, interface with parents and caregivers and provide referrals to other services for unmet needs. In addition to the 13 sport-for-protection sessions, during the phase of this study, one one-day event was organized in Lamwo district bringing together young people from all the different locations. To promote social and communal cohesion at local level, sports-based activities that promoted peaceful coexistence were organized with the participation of host and refugee young people, parents and caregivers and members of the community (see online supplement 3 for additional information).

2.5. Control condition

Participants allocated to the control condition were on a wait list for 16 weeks after which they were enrolled in the physical activity intervention. Participants in the control condition with severe symptoms were, similar to the participants in the experimental condition, immediately referred for specialized MHPSS services and those with other specific needs to non-specialized education, or health services (among others).

2.6. Demographic data

Age (years), sex (male, female), and disability (yes vs. no) and legal status (host vs. displaced) were collected at baseline. Disability refers to the presence of any observed or self-reported visual, hearing, speech, physical and/or mental impairment.

2.7. Patient health questionnaire-9 – adolescent version (PHQ-9-A)

The PHQ-9-A (Spitzer et al., 1999) is a nine-item depression scale. Each item asks the individual to rate the severity of their symptoms over the past two weeks, and is scored on a 4-point Likert scale with symptoms rated as 0 (not at all), 1 (several days), 2 (more than half the days) and 3 (nearly every day). The total score ranges from 0 to 27. Higher scores are indicative of more severe symptoms. The optimal cut-off for the presence of mild depressive symptoms is ≥5, for moderate depressive symptoms ≥10, and for severe depressive symptoms ≥20. The PHQ-9 is a valid tool for assessing depression among adolescents in rural Uganda (Nakku et al., 2016).

2.8. Generalized anxiety disorder-7 (GAD-7)

The Generalized Anxiety Disorder Assessment (GAD-7) is a seven-item instrument that is used in both adolescent and adult populations to measure or assess the severity of anxiety symptoms. Each item asks the individual to rate the severity of his or her symptoms over the past two weeks. Each item is scored on a Likert scale with symptoms rated as 0 (not at all), 1 (several days), 2 (more than half the days) and 3 (nearly every day). The total score ranges from 0 to 21. Higher scores are indicative of more severe symptoms. The optimal cut-off for the presence of mild anxiety symptoms is ≥5, for moderate anxiety symptoms ≥10, and for severe anxiety symptoms ≥15 [30]. The GAD-7 has been previously used with adolescents in Uganda (Mugisha et al., 2024).

2.9. Statistical analyses

Baseline differences in nominal data between the intervention and control group were explored using Chi square tests. Since age was not normally distributed following a Kolmogorov-Smirnov test, baseline difference in age was tested with a Mann-Whitney *U* test and presented as median (interquartile range). Per-protocol analyses with linear mixed modelling were conducted to test the effectiveness of the intervention. Before the analyses, data for all variables were inspected for missing values (none present due to a rigorous interviewer-administered data collection), outliers (none), and normality using the Kolmogorov-Smirnov test. Violations of normality were identified for PHQ-9-A and GAD-7 scores. Both the PHQ-9-A and GAD-7 were however not positive nor negatively skewed (skewness statistic = −0.03 and standard error = 0.06 for PHQ-9-A and skewness statistic = 0.43 and standard error = 0.06 for GAD-7), nor leptokurtic or platykurtic (kurtosis statistic = −0.69 and standard error = 0.11 for PHQ-9-A and kurtosis statistic = 0.58 and standard error = 0.11 for GAD-7). Since linear mixed effects models are considered robust to such minor violations of distribution assumptions (Schielzeth et al., 2020), we did not transform the data. We also included nominal moderating factors and presented PHQ-9-A and GAD-7 as means and standard deviations. Group (intervention vs. control), time (pre vs. post) and group by time were added as fixed effects. Potential moderating factors including sex (boys vs. girls), presence of disability (yes vs. no), and status (host vs. community) were added as fixed effects. Participants were included as a random effect to the model. The significance level was set at 0.05. To examine the moderating effects, post-hoc between-groups *t*-tests or ANOVAs with post-hoc Scheffe tests at baseline and post were conducted for all moderating factors found to have a significant effect on the linear mixed model. The mean differences between the intervention and control group on symptoms of depression and anxiety at post-intervention was calculated with 95 % confidence intervals (without Bonferroni corrections), controlled for the baseline level. Cohen d based on the pooled standard deviations was calculated to estimate the between-group effect sizes for changes in PHQ-9-A and GAD-7 scores with effect sizes equal to or larger than 0.20, 0.50, and 0.80 indicating small, medium, and large effects respectively (Cohen, 1988). The statistical analyses were conducted using IBM SPSS version 29.0. A justification for the statistical analyses considering the low dropout rate is provided in supplement 4.

3. Results

3.1. Participants

In total, 6364 young people between 15 and 24 years were identified across the 869 selected villages. Of these 6364 young people, 5910 (92.9 %) were deemed eligible. From the 5910 eligible young people, we aimed to randomize 875 to either the sport-for-protection or wait list control condition. A total of 32 participants (3.4 %) were lost during the study period, i.e. 26 displaced youth (16 in the control and 10 in the sport-for-protection condition) and six young people from the host community (five in the control condition and one in the sport-for-protection condition). Reasons for dropout included 24 displaced youth returning to their home country, two displaced young persons relocating, and six young people from the host communities relocating (i.e. lost to follow-up). Consequently, 834 youth affected by displacement from the five catchment areas were included, comprising 421 participants in the sport-for-protection condition and 413 participants in the wait list control condition. In total, 65 participants in the sport-for-protection condition scored above the cut-off for severe depression, while the 19 who scored above the cut-off severe anxiety also scored above the cut-off for severe depression. Consequently, 65 (15.4 %) participants were referred for specialized MHPSS services. In the wait-list control condition, 61 scored above the cut-off for severe depression, 22 above the cut-off severe anxiety, while 21 above both cut-off scores, indicating 62 (15.0 %) were referred for specialized MHPSS services. The completion rate (i.e. participating in at least 10 of 13 sessions) in the sport-for-protection condition was with 96 % high. Baseline demographic data of both groups who completed the intervention are presented in Table 1. There were proportionally more girls in the intervention condition compared to the wait-list control condition (53.1 % vs 46.9 %, $P < 0.001$). No other significant differences between both groups were found at baseline.

3.2. Changes in depression and anxiety following sport-for-protection versus a wait list control condition

Results of the linear mixed model analyses found there was a significant difference in PHQ-9-A and GAD-7 scores between the intervention and control group (see group-effect in Table 2: $P < 0.001$). Post-hoc *t*-tests demonstrated there was no difference in baseline PHQ-9-A [degrees of freedom (df) = 830.4, $P = 0.91$] and GAD-7 (df = 831.9, $P = 0.73$) scores between groups, only in post-test PHQ-9-A (df = 654.1, $P < 0.001$) and GAD-7 (df = 832.0, $P < 0.001$) scores. PHQ-9-A and GAD-7 improved significantly over time in both the wait-list control and intervention groups (see time-effect in Table 2: $P < 0.001$); however, there was a significant interaction effect indicating differential rates of

Table 1
Baseline demographics of the participants who completed the study.

Characteristics	Total sample ($n = 834$)	Intervention group ($n = 421$)	Control group ($n = 413$)	*P*-value*
Age (years)	19.0 (3.0)	19.0 (3.0)	19.0 (3.0)	0.68
Sex [n (%) boys / n (%) girls]	391 (46.9 %) / 443 (53.1 %)	232 (55.1 %) / 189 (44.9 %)	159 (38.5 %) / 254 (61.5 %)	<0.001*
Disability [n (%) yes / n (%) no]	123 (14.7 %) / 711 (85.3 %)	55 (13.1 %) / 366 (86.9 %)	68 (16.5 %) / 345 (83.5 %)	0.17
Legal status [n (%) host vs / n (%) displaced]	246 (29.5 %) / 588 (70.5 %)	125 (29.7 %) / 296 (70.3 %)	121 (29.3 %) / 292 (70.7 %)	0.94

* Significant when $P < 0.05$ using Mann Whitney *U* tests for age and Chi square tests for nominal data. Age is not normally distributed and therefore presented as median (interquartile range). Nominal data are presented as numbers (percentages). GAD-7 = Generalized Anxiety Disorder-7; PHQ-9-A = Patient Health Questionnaire −9, adolescent version.

improvement between groups (see group*time effect, Table 2: P < 0.001). Post-hoc tests revealed a large anti-depressant and anxiolytic effect for the intervention versus wait-list control condition (Cohen d effect sizes in Table 2).

3.3. Moderating effects for the antidepressant effects of sport-for-protection

Moderating factors with a significant impact on change in PHQ-9-A scores over time were the district where the intervention took place (F = 50.8, P < 0.001) and the presence of disability (F = 13.4, P < 0.001). The legal status (host vs displaced) (F = 0, $P = 0.85$), sex (F = 1.7, $P = 0.19$), and age (F = 1.9, $P = 0.16$) were not moderating factors.

With regards to the district where the intervention took place, PHQ-9-A baseline scores were higher in Adjumani compared to other districts (all P < 0.001). Cohen d effect sizes for physical activity vs the wait list control conditions were small to large in the different districts (see Supplementary Table 1). The difference in PHQ-9-A post-scores between the physical activity and wait list control condition was not significant in Kampala (F = 2.8, $P = 0.10$).

When looking at the disability status, PHQ-9-A baseline scores were statistically lower for those with compared to without a self-reported and/or observed disability (9.7 ± 4.6 vs 10.8 ± 4.6, F = 6.1, $P = 0.014$, mean difference = −1.1, 95%CI = −0.2 to −2.0). The mean difference for the PHQ-9-A post-scores between those with vs without a self-reported and/or observed disability was larger (6.5 ± 5.6 vs 4.9 ± 5.6 respectively, F = 8.1, $P = 0.005$, mean difference = −1.5, 95%CI = 0.5 to −2.6) than the mean difference for the baseline scores. Cohen d for the effect of sport-for-protection vs the wait list control condition in those with disability was still large (1.53, 95%CI = 1.12 to 1.94). In those without disability, it was 1.28 (95%CI = 1.12 to 1.44).

With regards to the legal status PHQ-9-A baseline scores were similar for displaced youth compared to youth from the host communities (10.7 ± 5.4 vs 10.6 ± 4.4, F = 0.02, $P = 0.88$, mean difference = 0.1, 95%CI = −0.6 to 0.7). The difference for the PHQ-9-A post-scores between displaced youth compared to youth from the host communities was not significant (5.2 ± 5.3 vs 5.0 ± 6.3, F = 0.3, $P = 0.55$, mean difference = 0.2, 95%CI = -1.1 to 0.6). Large effect sizes for the antidepressant effects of sport-for-protection compared to a waitlist control condition was found in both displaced youth (Cohen d = 1.33; 95 % CI = 1.16 to 1.51) and youth from the host communities (Cohen d = 1.30; 95 % CI = 1.03 to 1.58).

Related to sex, large effect sizes for the antidepressant effects of sport-for-protection compared to a waitlist control condition was found in both boys (Cohen d = 1.36; 95 % CI = 1.14 to 1.58) and girls (Cohen d = 1.26; 95 % CI = 1.05 to 1.47).

Table 2
Changes in depression and anxiety over time following physical activity versus a wait-list control condition.

Variable	Physical activity intervention (n = 421)			Wait-list control condition (n = 413)			Cohen d		Group		Time		Group*Time	
	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Difference	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Difference	ES	95%CI	F	P	F	P	F	P
PHQ-9-A	10.7 ± 4.6	2.3 ± 3.3	−8.4	10.6 ± 4.7	8.3 ± 5.7	−2.3	1.32	1.17–1.47	158.9	<0.001*	539.2	<0.001*	178.6	<0.001*
GAD-7	12.8 ± 5.9	2.8 ± 4.4	−10.0	12.7 ± 5.9	10.0 ± 7.1	−2.7	1.21	1.06–1.36	189.6	<0.001*	624.2	<0.001*	203.0	<0.001*

Significant when $P < 0.05$. GAD-7 = Generalized Anxiety Disorder-7; PHQ-9-A = Patient Health Questionnaire −9, adolescent version, ES = effect size, SD = standard deviation.

3.4. Moderating effects for the anxiolytic effects of sport-for-protection

Moderating factors with a significant impact on change in GAD-7 scores over time were the district where the intervention took place ($F = 38.9$, $P < 0.001$), the presence of disability ($F = 5.0$, $P = 0.026$), and age ($F = 4.6$, $P = 0.03$). The legal status (host vs displaced) ($F = 0.4$, $P = 0.34$) and sex ($F = 1.8$, $P = 0.18$) were not moderating factors.

With regards to the district where the intervention took place, GAD-7 baseline scores were higher in Adjumani compared to other districts (all $P < 0.001$). Cohen d effect sizes for physical activity vs the wait list control conditions were small to large in the different districts (see Supplementary Table 2). When looking at the disability status, GAD-7 baseline scores were statistically lower for those with compared to without a self-reported and/or observed disability (11.5 ± 5.1 vs 12.9 ± 6.0, $F = 4.3$ $P = 0.038$, mean difference $= -1.2$, 95%CI $=0.0$ to -2.3). The mean difference for the GAD-7 post-scores between those with vs without a self-reported and/or observed disability was larger (8.7 ± 7.0 vs 6.0 ± 6.8, $F = 17.3$, $P < 0.001$, mean difference $= 2.8$, 95%CI $= 1.5$ to 4.1) than the mean difference for the baseline scores. However, Cohen d for the effect of sport-for-protection vs the wait list control condition in those with disability was still large (0.99, 95%CI = 0.61 to 1.37). In those without disability, it was 1.24 (95%CI = 1.08 to 1.49).

With regards to the legal status, similar GAD-7 baseline scores were found for displaced youth compared to youth from the host communities (12.7 ± 5.5 vs 12.8 ± 6.7, $F = 0.03$, $P = 0.86$, mean difference $= 0.5$, 95%CI $=0.2$ to 0.9). The difference for the GAD-7 post-scores between displaced youth compared to youth from the host communities was not significant (6.4 ± 6.6 vs 6.2 ± 7.6, $F = 0.1$, $P = 0.74$, mean difference $=$ 0.2, 95%CI = -0.8 to 1.2). Large effect sizes for the anxiolytic effects of sport-for-protection compared to a waitlist control condition was found in both displaced youth (Cohen d = 1.15; 95 % CI = 1.0 to 1.32) and youth from the host communities (Cohen d = 1.34; 95 % CI = 1.06 to 1.61).

Related to sex, large effect sizes for the antidepressant effects of sport-for-protection compared to a waitlist control condition was found in both boys (Cohen d = 1.11; 95 % CI = 0.89 to 1.33) and girls (Cohen d = 1.26; 95 % CI = 1.06 to 1.47).

4. Discussion

To the best of our knowledge, this is the first randomized controlled trial investigating the effectiveness of a sport-for-protection program on symptoms of anxiety and/or depression in youth affected by displacement. We found large antidepressant and anxiolytic effects of a 16-week sport-for-protection program compared to a wait-list control condition. Importantly, large effect sizes were found in both boys and girls, and in those with and without disability demonstrating the inclusivity of the program. Our data therefore show that inclusive physical activity interventions accommodating diverse abilities do contribute to a reduced mental health burden within displaced youth and youth from host communities. Moreover, our data demonstrate that sport-for-protection programs targeting mental health outcomes are highly needed since over 90 % of young people across the catchment areas assessed for our study reported at least mild anxiety or depression. Significantly higher baseline levels of depression and anxiety were observed in the Adjumani district compared to the other 4 districts. A reason could be that this hosting district has with 48 % the highest proportion of displaced people related to the entire population in the district (221,896 displaced people / 460,896 inhabitants in the district). In the other districts the proportion is 36 % (82,201/230,301) in Lamwo, 25 % (136,741/551,141) in Kikuube, 14 % (95,461/665,261) in Kamwenge, and 6 % (106,143 / 1,872,643) in Kampala (UNHCR, 2024). A higher proportion of displaced people has a serious impact on the available resources and available access to services. Additionally, Adjumani district also receives more new arrivals compared to other settlements. These newcomers often report more acute mental health challenges.

Although more research is needed about which factors contributed to the inclusive nature of the sport-for-protection program, we hypothesize that the creation of a physically and psychologically safe and supportive environment, opportunities to build individual skills by giving time and support to each individual, and the positive and sustained support and mentoring of peer leaders and coaches were important. The dropout from the program was very low (3.4 %), which is likely due to the fact coaches visited the homes of those who did not join the last session. Together with parents and/or significant others in the families reasons were explored, together with potential mental, physical, psychosocial or educational needs and the type of support that could be provided within the local context. In order to lower the threshold for girls to participate, female coaches were part of the staff, parents or significant others were informed about the importance of physical activity for both boys and girls, and activities which are preferred by girls such as netball were also arranged. The reason why large mental health benefits were observed in displaced youth and in youth from host communities and in youth with a disability could be due to the fact that during activities it was ensured that all teams were diverse in composition, while the focus was on the playing together by adapting the rules instead of a primary focus on competition. A previous randomized controlled trial investigating a sport-for-development intervention in a post-conflict setting in Northern Uganda (Richards et al., 2014), demonstrated that a competitive environment might have an adverse impact on the mental health of young people previously exposed to conflict characterized by a high prevalence of internal displacement. In the current sport-for-protection program, youth and other stakeholders co-created ways of handling conflict and adapted these strategies to the context.

Our findings are in line with existing literature illustrating that if physically and psychologically safe, sport and physical activity in the context of humanitarian assistance are capable of improving the mental well-being of young displaced youth (Think Tank Olympic Refuge Foundation, 2022). For example, a Capoeira dance and martial arts program implemented within the school environment of young refugees aged 12 to 17 years in Australia reduced behavioral problems and was associated with improvements in interpersonal skills, confidence, respect for self and others, self-discipline, and an overall sense of responsibility (Mom et al., 2019). Similarly, a yoga intervention implemented within the school environment for young refugees in Norway resulted in an improved ability to regulate and cope with stress and strong emotions (Hagen et al., 2021). Recently, it was also shown that a physical activity program consisting primarily of football, basketball, volleyball and a combination of endurance and weight training and organized within a supportive and inclusive, culturally sensitive environment can promote the physical and mental health of adolescent refugees and migrants aged 12 to 17 years in a Greek refugee camp (Adamakis, 2022). Within a low-income context, a movement intervention in 10- to 15-year-old school going South Sudanese and Ugandan children in a refugee settlement in North Uganda resulted in a better emotional and psychosocial wellbeing, satisfaction with and attitude toward school, a better health-related quality of life, physical health and sense of agency, and less traumatic stress compared to a care as usual control group (Bleile et al., 2024), benefits which were largely maintained after 5 months (Jordans et al., 2024). However, all these previous studies relied on uncontrolled or non-randomized pre-post methodologies. The current data provide more rigorous evidence from a randomized controlled trial in support of implementing physical activity programming within humanitarian settings.

Of note, when investigating differences in the outcomes of the program between different sites, we did notice that no difference in antidepressant effects between sport-for-protection and the wait list control intervention was found in Kampala, the largest city and capital of Uganda. Reasons could be the challenge in creating a physically safe sport environment in large urban centers, unsafe and expensive transport toward the physical activity facility, lack of green space, lack of access to social services and more severe socio-economic challenges and

less social support for urban youth (Adebusoye et al., 2022; Swahn et al., 2022; Nakabazzi et al., 2021; Vancampfort et al., 2019).

Future research should therefore investigate multilevel barriers for successful implementation in different humanitarian settings, with a particular focus on youth affected by displacement living in large urban centers. To this end, knowledge on factors at the individual level (e.g., experienced barriers by displaced youth and youth and other stakeholders from the host communities) and using co-design principles from the start with adequate representation from and consultation with those individuals is vitally important (McKeon et al., 2024). Beside individual barriers, also environmental (e.g., community, system and policy related influences) and organizational level factors (i.e., ensuring adequate resourcing, organizational culture and infrastructure) should be explored in more detail. Regarding resourcing, this may also include investigating the effectiveness of training existing mental health and psychosocial support workforce, e.g. in basic principles of physical activity promotion. Similarly, the effectiveness of training professionals providing physical activity and sports programs in basic psychosocial support principles and skills, including psychological first aid could be investigated in more detail. With regards to the infrastructure, the most effective characteristics of physically and psychologically safe environments to deliver physical activity and sports programs to ensure that no one is left behind should be explored. Finally, future research could explore the long-term effects of physical activity interventions in youth affected by displacement and potential underlying mechanisms for the antidepressant and anxiolytic effects. The current evidence indicates there are several neurobiological and psychosocial pathways that could explain the observed reductions in anxiety and depression (Kandola et al., 2018 & Kandola et al., 2019). For example, neurobiological changes such as an increased cerebral blood volume and/or flow and changes in peripheral biomarkers such as an increase in circulating growth factors, and anti-inflammatory markers have been reported before (Schuch et al., 2016). From a psychosocial perspective sport and physical activity provides young people opportunities for social interaction (relatedness), mastery of the situation (self-efficacy and perceived competence), and improvements in self-perception (self-esteem and body image) (Lubans et al., 2016). In particular the psychosocial mechanisms might be relevant to explore in the context of displacement. Physical activity and sport can be regarded as activities which every participant can perform at one's own ability within a group. With regards to self-efficacy and perceived competence, existing theoretical models such as the Exercise and Self-Esteem Model (Sonstroem et al., 1991) demonstrate that participating at one's own pace may improve self-efficacy, which generalizes to one's physical self-concept and consequently, further to global self-esteem.

The current findings should however be interpreted considering some limitations. First, the randomization placed young people from the same households in either treatment and wait-list control groups, while several young people in the control group benefitted from similar projects from other non-governmental organizations working in the catchment areas. In addition, some young people in the control group were exposed to the treatment condition since the sport-for-protection intervention was conducted in public spaces. Similarly, young people in the treatment group frequently shared their experiences and what they had learned from the sessions with their siblings and friends in the control group. Besides this, participants with severe symptoms in the control condition were referred for specialized MHPSS services and those with other specific needs to non-specialized education, or health services (among others). All of this could partly account for the observed improvements in outcomes of the control group. Second, we only explored the outcomes on depression and anxiety immediately post-intervention.

In conclusion, this is the first randomized controlled trial demonstrating that sport-for-protection reduces mild to moderate anxiety in displaced youth and youth within the host communities. More research about how this program can be implemented in different humanitarian settings and within different cultural contexts is needed.

CRediT authorship contribution statement

Kathleen Latimer: Writing – review & editing, Supervision, Resources, Methodology, Funding acquisition, Conceptualization. **Rita Larok:** Writing – review & editing, Project administration, Conceptualization. **John Paul Nyeko:** Writing – review & editing, Project administration, Data curation. **Lydia Murungi:** Writing – review & editing, Project administration. **Ronald Luwangula:** Methodology, Investigation. **Bashir Lukungu:** Data curation. **Jeroen Carrin:** Writing – review & editing, Project administration, Funding acquisition. **Robinah Nannungi:** Writing – review & editing, Project administration. **Daniel Ojara Comboni:** Writing – review & editing, Project administration. **Esther Nanfuka Kalule:** Methodology, Investigation. **Simon Rosenbaum:** Writing – review & editing, Validation. **Davy Vancampfort:** Writing – original draft, Formal analysis, Conceptualization.

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Declaration of competing interest

There are no conflicts of interest to report.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jad.2025.02.001.

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