



Review article

Using Technology to Scale up Youth-Led Participatory Action Research: A Systematic Review



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 A B S T R A C T

Purpose: Rapid advances in technology create opportunities for adolescents to influence practice and policy in health and other domains. Technology can support the scaling of Youth-Led Participatory Action Research (YPAR), in which adolescents conduct research to improve issues that affect them. We present the first known published systematic review of the use of technology to scale YPAR.

Methods: A systematic review of the empirical literature was conducted from 2000 to 2018 using databases PsycARTICLES, PsycINFO, and PubMed. The review included peer-reviewed articles of YPAR studies involving adolescents (aged 10–19 years) using technology for scaling. Appraisal of papers included the role of technology and consistency with YPAR principles.

Results: Nine peer-reviewed YPAR publications focusing on a range of health issues with adolescents aged 11–19 years were identified. Technology included Facebook (most common), Twitter, Instagram, Skype, e-mail, blogs, and personalized mapping applications. Overall, technology was primarily used for adolescent participants to gather data. The appraisal revealed the complexities inherent in conducting YPAR using technology across multiple sites, with different adults in supportive roles and varying levels of opportunities for adolescent engagement.

Conclusions: This review provides insights at the intersection of youth-led research and technology, highlighting opportunities in a changing technological landscape and the challenges of YPAR at scale.

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IMPLICATIONS AND CONTRIBUTION

This review confirmed the opportunities that technology provides to scale up the reach and impact of YPAR projects with adolescents. Given the current limited evidence to guide practice, it is timely to reflect on the added complexities associated with maintaining participatory principles while involving increased numbers of both adolescents and adult partners, working across multiple sites and mediums. There is a clear need to update current YPAR and related adolescent participatory research models and frameworks to provide guidance for how to manage these complex multilevel collaborative relationships.

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Explosive growth in digital technology is transforming the experience of adolescence across the world [1,2]. The *Lancet* Commission on Adolescent Health and Wellbeing [3] identified adolescence as a critical phase for achieving life potential and noted the opportunities offered by digital media to engage adolescents who are “biologically, emotionally, and developmentally primed for engagement beyond their families” (p. 2424). Adolescents tend to embrace new technologies [4,5], representing an estimated one in three Internet users globally [6]. This gives them unprecedented access to information and different ways of expression in the digital world that were not available for previous generations [7]. Technology is also reshaping methods of research and helping to bridge geographic and social distances [8]. Digital technologies, such as videoconferencing, online chat rooms, and social media, provide promising mechanisms for enabling adolescents to take agentic roles in research investigations and programming to support adolescent health and well-being. Youth-Led Participatory Action Research (YPAR) is a form of participatory research, which promotes these agentic roles. Adolescents are trained and supported to conduct research that addresses issues they have identified as affecting their lives [9]. YPAR aims to achieve sustainable changes in a relevant setting, service, program, or policy [10]. In this article, we present a systematic review, which examines the use of technology to scale up the reach and impact of YPAR projects.

Cutting across fields and constituencies in adolescent health, there are multiple framings that emphasize the importance and potential impact of YPAR [10,11], which we briefly review here to provide a context for our present study on technology for the scaling of YPAR. A rights-based framing posits that adolescents' participation in health-related research, services, and systems that affect them is a fundamental right [12]. Consistent with this framing, participatory health research approaches promote young people's right to have their voices heard by actively involving them across the research process, from its design to its dissemination [13–15]. A second type of framing—both “instrumental” and epistemological in nature—highlights that adolescents provide unique “insider” phenomenological expertise such that adolescent-generated research knowledge can enhance the validity of research on adolescent health and well-being and lead to more effective design of adolescent-focused services and systems [10,16]. Third, there is a growing research literature that examines the effects of YPAR on adolescents and developmental settings, identifying outcomes, such as new leadership opportunities for adolescents, practitioner growth, research quality, and policy changes [17–22], shifts in the perceptions of adult opinion leaders in recognizing the value and input of adolescents in key decisions [23,24], and benefits for participants across developmental, psychological, citizenship, and academic outcomes [10,25–28]. Participation in YPAR is likely to be particularly beneficial for youth who experience disadvantage and challenges to agency [29,30]. It is unclear how use of technology in YPAR would influence the potential benefits or costs.

New technologies can provide opportunities for adolescents to develop their civic engagement [31,32]. Activities, such as accessing information, networking, and producing online content, provide opportunities for adolescents to connect to each other on equal terms, allowing the identification of common interests and mobilizing collective action [33,34]. In this way, adolescents are not passive technology users but active agents

capable of widespread social change [35]. This was evident when online coverage of a solo school strike protesting climate change by a Swedish student triggered mass student protests in at least 270 towns and cities internationally, in countries including Australia, the United Kingdom, Belgium, Japan, and the U.S., resulting in an invitation for the student to address a UN Climate Change Summit in 2018 [36].

In addition, there is historical precedent for the use of technology to support YPAR. For example, the TeenNet action research project was established in 1995 to involve teenagers in the development and management of a health promotion website [37]. Flicker et al. [38] first proposed an e-PAR model to combine technology with Participatory Action Research for working with children and youth. Technology was meant to promote youth's self-expression, communication, and skill-building while critically researching their worlds and developing strategies for social change [38]. Since then, new developments have expanded adult researchers' views on how technology can help incorporate children and young people's perspectives in research relevant to their lives. In YPAR 2.0, young people use innovative ways to apply local knowledge to “deepen civic engagement, democratize data, expand educational opportunity, inform policy, and mobilize community assets” (p. 1287) [53]. Innovation includes using diverse technologies, such as mobile devices and social media, to help youth collaborate in real time to potentiate aspects, such as the visualization, storage, and communication of data, as well as its ownership by the community. Similarly, the YPAR Hub was established in 2015 by UC-Berkeley as an online tool to support YPAR activities (<http://yparhub.berkeley.edu/>).

However, there is as yet no published systematic analysis of how digital technologies are being used to scale opportunities for adolescents in YPAR and how such efforts balance scaling and meaningful participation. This is important, considering that high-quality YPAR implementation requires ongoing and intentional processes to build trust and balance power sharing on key decisions across the project phases among peers and with adult facilitators [39]. A particular challenge is to prevent YPAR from becoming “tokenistic,” in which children and adolescents end up as tokens of participation or “window dressing” for adult agendas [40]. This systematic review focuses on projects using participatory approaches to engage adolescents as decision-makers in YPAR, using technology to scale up project reach and impact. Our analysis focused on the methods and processes. Specifically, our review aimed to address (1) what forms of technology were used to scale up the participatory research and how were they used and (2) how were the participatory elements of the research maintained within that process?

Terminology

The terminology used for children and youth is complex and often differs across countries and social contexts. Thus, we used multiple search terms for our review as described below. For brevity, we will use the term “adolescents” for the remainder of the article when referring to the target age group, to be consistent with the World Health Organization definition of those aged between 10 and 19 years [41]. The terminology for participatory forms of research also varies [42]. We use the commonly used term “YPAR” to represent participatory research approaches involving adolescents in the cocreation of knowledge and

advocacy and generation of subsequent health and social change outcomes.

Methods

Data collection included the following stages: (1) an intensive systematic review of existing literature and (2) follow-up phone discussions with each study's lead authors.

Literature review

The literature review examined the use of technology to scale YPAR projects involving adolescents by locating articles that used technology to extend research activities and decision-making beyond one geographic site (i.e., adolescent group/school or community). Articles were included if they were (1) empirically reviewed, (2) in English, (3) published between 2000 and 2018, (4) consisted of adolescent participants (aged 10–19 years), and (5) explicitly discussed using technology to scale up YPAR efforts. Social media have only been developed and accessible to the public within the last two decades; thus, our sample was restricted to the period between January 2000 and 2018. Our search focused on adolescents, with sample participants between 10 and 19 years old. Finally, projects that used technology for internal project activities rather than to extend the reach and impact of the project were excluded from the review.

The electronic databases PsycARTICLES, PsycINFO, and PubMed were used to search for empirical sources. Google Scholar was also used to cross-check literature review findings. In addition, we used the following terms to identify potential articles: “youth participatory action research AND social media/OR digital tools/OR digital platforms,” “community-based participatory action research AND adolescent/children/teenagers, AND social media/OR digital tools/OR digital platforms,” “Action research AND adolescent/children/teenagers, AND social media/OR digital tools/OR digital platforms.” Search engines were last reviewed on August 17, 2018.

The search protocol was piloted by three of the review authors (M.K., K.M., and S.B.) to ensure consistency in search terms and search results. Next, two of the review authors (M.K. and S.B.) screened the title, abstract, and keywords of selected articles against the inclusion and exclusion criteria. If this provided insufficient information, the full-text article was retrieved and reviewed to decide. Following this initial screening, full-text articles for selected papers were checked against the inclusion and exclusion criteria. Differences were resolved via discussion between the authors performing the screening; any unresolved issues were cross-checked with other authors as needed. If an article met the inclusion criteria, the following information was entered into an Excel spreadsheet: author, year, journal, study length, participant age, sample size, country, research topic, reach or geographic coverage (local, national, international) as well as notable themes (i.e., challenges, benefits, power dynamics, etc.).

An appraisal of technology use was conducted to identify the type of digital technology and online platforms used in each project and the way technology supported and scaled up different YPAR activities. The role of technology was reviewed by the study reviewers in collaboration with the study authors and documented with the corresponding stage of the YPAR process as described in the YPAR literature [43,44] (Table 1). Finally, Shier's [13] framework was applied in an appraisal of participatory approaches to examine power sharing between the adults and the adolescent researchers at each stage of the research process, ranging from adolescents not being involved, consulted, collaborating, and directing and deciding for themselves.

Phone discussions. Follow-up conversations with study authors were conducted (by review author M.K.) across all five projects as a collaborative opportunity to cross-check our understandings and to fill gaps in the information provided in the published accounts to enable more thorough and accurate appraisals of technology use and participatory approaches to be undertaken. The discussions ranged from 30 to 90 minutes. The phone conversations elicited additional unanticipated information regarding challenges

Table 1
Youth-Led Participatory Action Research and technology appraisal tool

Research phase	Participation	Application of digital technology in YPAR project
Study design	<ul style="list-style-type: none"> Decision-making in research/study design (methods, measures) Decision-making in sample size, location, and participants 	<ul style="list-style-type: none"> Digital technology is employed to organize and determine the scope, direction, and design of the research project. Example: digital technology to discuss or brainstorm potential projects via a shared document, blog, or online group discussion, etc.
Issue selection	<ul style="list-style-type: none"> Decision-making on issue of interest (i.e., focus of YPAR project) Co-create/craft research question of inquiry 	<ul style="list-style-type: none"> Digital technology is used to facilitate the issue selection process. Example: using digital technology, a survey, online discussion board, or blog to “vote” or “elect” an issue of interest for the project.
Implementation	<ul style="list-style-type: none"> Engage in data collection or development of data collection tools Conduct surveys, field notes, interviews, or focus groups 	<ul style="list-style-type: none"> Creation of digital tools/platforms Digital technology is used to either recruit participants or gather data. Example: recruiting participants via online platforms (i.e., social media) and making flyers or internet graphics/website. Collecting data from participants via digital technology such as an online survey, blog, etc.
Data analysis	<ul style="list-style-type: none"> Reviewing and co-analyzing results 	<ul style="list-style-type: none"> Digital technology is used to analyze, visualize, or identify common themes within the data. Example: data analysis software or other computer programs (e.g., Excel [45] and Visone [46])
Dissemination and Social Action	<ul style="list-style-type: none"> Decision-making regarding moving the findings toward action Sharing findings with audiences (and selecting which audience to share with) 	<ul style="list-style-type: none"> Digital technology is strategically used to share/disseminate findings to educate the larger public and mobilize others to act. Example: sharing findings using digital technology: crafting a video, a poster/flyer, sharing information on YouTube or social media, developing a website, etc.
Evaluation of the Research Process	<ul style="list-style-type: none"> Analyzing and assess the research process and next steps. 	<ul style="list-style-type: none"> Digital technology/platforms are used to evaluate the project, discuss the next steps, and strategic planning.

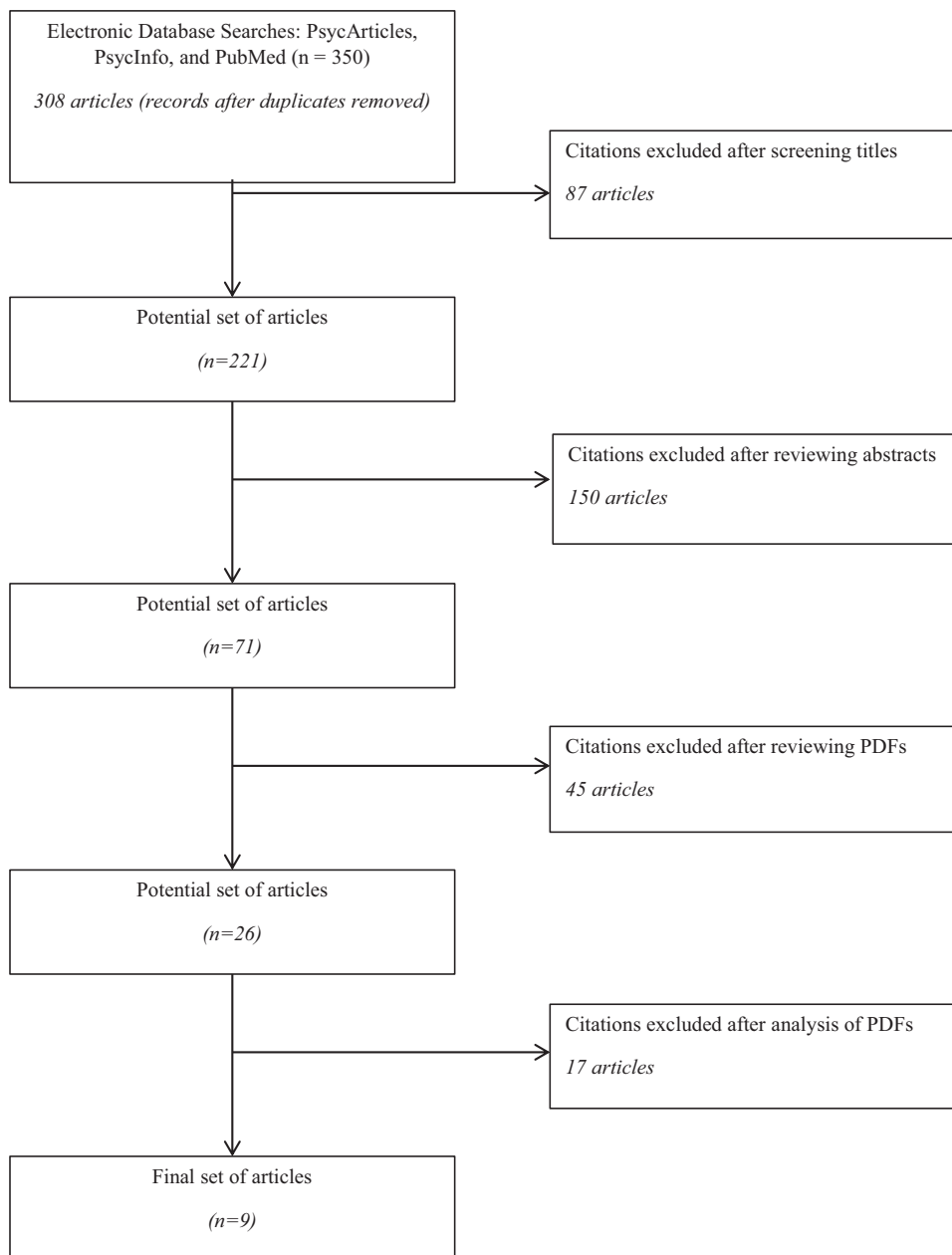


Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow chart.

in implementation, participant uptake of technology, and future considerations. Extensive field notes were taken for each phone discussion, which were subsequently combined and categorized to support the framework analysis described below. Similarities and differences within and across categories were examined to enhance our interpretation of the appraisal findings.

Analysis

To guide data analysis and interpretation, the author(s) used framework analysis [47]. Notably, framework analysis offers flexibility in the data analysis process in that analysis can begin during or after data collection. The framework analysis consisted of the following stages: (1) in-depth familiarization with key literature

review articles, (2) identification of emerging patterns and themes guided by the appraisal tools, (3) indexing significant texts, (4) charting key excerpts to illustrate or modify emerging trends, and (5) mapping findings using schematic diagrams to inform data interpretation. The process was then repeated, refined, and adapted when gaps in the framework were identified by incorporating the field notes from phone discussions with study authors.

Findings

Search results

Application of the search protocol yielded a total of 350 articles, 308 (nonduplicated) articles, of which 299 were

Table 2
Project characteristics

Project number	Location	Length	Topic focus	Sample size: adolescent co-researchers	Age
Project 1, Dream Teens [48–51]	Portugal (National)	1 year	Public Health: personal resources and well-being, social capital, love and sexuality, substance use and injuries, lifestyle, and citizenship and social participation	247	11–18
Project 2, Peer Resources [33,52]	San Francisco (three schools), California, USA	6 months	Public health: sex education, mental health, and school counselor availability	54	14–18
Project 3, Streetwyze [53]	Oakland (citywide), California, USA	3 years	Public health: food inequity and insecurity	90	16–18
Project 4, NYLI [54]	West Virginia, USA	Not specified (2 years)	Public health: drug prevention	130	12–19
Project 5, JaxHERO [55]	Jacksonville, Duval County, Florida, USA	3 years	Public health: obesity and health inequity	9	15–19

subsequently excluded based on the inclusion/exclusion criteria (Figure 1). For instance, we excluded papers in which youth used technology to disseminate findings within an organization but not as part of the research process or coordination, such as Girls Study Girls Inc. [23]. The remaining nine empirical articles were identified as using some form of digital technology to facilitate YPAR efforts across distinct geographic regions. These projects used digital technology in the context of mobilizing conversation, research, and social action among diverse adolescent groups and stakeholders. Although a total of nine articles were identified, two of the articles described the same project located within the Bay Area, USA. In addition, four of the articles described the same project connecting adolescents on a national scale across Portugal. Thus, the sample consisted of five unique and distinct projects.

Project characteristics

Projects varied in the number of adolescent participants ranging from 9 to 247 participants and ages ranged from 11 to 19 years (Table 2). In addition, the geographic distance covered for each project varied from connecting three schools within one city to a citywide collaborative to countywide efforts and a national project. Four of the projects were conducted within the U.S. while the national project was conducted in Portugal. The projects addressed a wide range of public health topics, including sexuality, substance use, mental health, obesity prevention, social capital, and citizenship.

Appraisal of technology use

Articles were reviewed and assessed on how technology was used to facilitate YPAR processes across geographically distinct groups. Although Facebook [56] was the most common social media platform, projects used Twitter [57], Instagram [58], Skype [59], e-mail, and blogs, as well as personalized applications designed for the purposes of community mapping (i.e., Streetwyze [60]). Overall, technology was primarily used for adolescent participants to gather and share information (Table 3).

The variation across the projects in the type of technology used and its purpose is an indicator of the range of options available:

- Project 1 (Dream Teens, Portugal) used technology to recruit adolescent participants (via social media posts) and screened

participants (via Skype interviews). Adult research team members provided adolescents with online feedback, information, and the tools to design their own research study, identify an issue of interest, and analyze the data gathered via a private Facebook group. The adolescent research team further screened and polled adolescents belonging to a larger public Facebook group. Adolescents presented their findings/recommendations for participant feedback via website and a livestreamed conference. Key decisions for the YPAR project were made online to facilitate conversations among adolescents on a national scale.

- Project 2 (Peer Resources, San Francisco) also used Facebook. In the context of this study, three school-based groups conducted their on-the-ground YPAR projects, each within their own school. Key questions, updates, and information were shared online throughout the YPAR process. Data collection was predominantly conducted offline; however, the Facebook platform was used to schedule interviews across schools and to ask for input on results during the data analysis stage. In addition, school-based YPAR groups communicated online to collaborate in determining final social action plans and dissemination efforts.
- Project 3 (Streetwyze, Oakland) employed and developed Streetwyze, a community mapping application, to gather neighborhood-level data surrounding food insecurity and access. The application was developed in real-time (i.e., piloting data collection and online feedback sessions), and in partnership with adolescents to guide the research design process. For instance, participants went to local convenience stores to record the amount of fresh produce available. These local data were combined with census trends as well as public health indicators to allow participants to visualize and analyze geographic food insecurities in real time (comparing and contrasting personalized and big data). Local groups could simultaneously collect data and share their data findings with others throughout the city.
- Projects 4 (NYLI, West Virginia) and 5 (JaxHERO, Jacksonville) used online platforms (Facebook and WordPress [61]) to gather and share data across geographic distances using photovoice (a photographic ethnographic documentation method to facilitate social change). Thus, the online platform allowed adolescent participants to view one another's photographs, narratives, and observations, spurring data collection. In addition, adolescents were able to ask questions and brainstorm the next steps using these digital platforms. Notably,

Table 3
Technology use throughout project stages

Project number	Recruitment	Study design	Issue selection	Implementation (data collection)	Data analysis	Dissemination and social action
Project 1: Dream Teens	Skype, Facebook	Facebook	Facebook	Facebook	Facebook	Facebook, Skype, Webinar
Project 2: Peer Resources				Facebook	Facebook	Facebook
Project 3: Streetwyze		Streetwyze		Streetwyze	Streetwyze	Streetwyze
Project 4: NYLI				WordPress	WordPress, Google Docs, Skype	WordPress, YouTube
Project 5: JaxHERO				Facebook, Twitter, Instagram, and e-mail		

Project 4 involved a subgroup of adolescents who engaged in data analysis using Google docs [62] and Skype to thematically code photovoice posts and narratives. In addition, all adolescents in Project 4 created digital stories (videos, Web sites, and exhibits) to disseminate information to larger audiences.

Follow-up phone conversations with YPAR study authors allowed for a deeper analysis of the application of technology, specifically addressing the benefits and advantages of using technology in YPAR projects, the obligations of the adult researchers supporting the YPAR project, and challenges experienced at specific stages of the YPAR process involving use of technology.

Benefits. Study authors stressed the importance of technology for increasing the scale of projects and democratizing young people's access to information, research skill development, and civic participation. Across projects, study authors noted the opportunity to access and engage historically underserved communities, in particular, adolescents who did not have access to programs or services within their local communities. The online platform also allowed participants to engage in research and inquiry at their own pace. For instance, researchers could easily inquire further into an idea by replying or referencing a specific comment proposed earlier by an adolescent participant at the individual and group levels within a social media thread. Authors noted that this experience allowed for further in-depth exploration of particular issues and documentation of conversations, prompting opportunities for critical reflection (e.g., adolescents re-reading their posts and initial ideas). In addition, technology allowed researchers to quickly access real-time data and provide recommendations to funders, organizations, and programs based on aggregated trends. Adult researchers were able to also reduce research expenditures (e.g., transcription and data entry) compared with traditional in-person research methods (e.g., interviews, focus groups, and surveys).

In the context of the various stages of YPAR, study authors noted the importance of technology in facilitating data collection and information sharing between young people and adult research team members. For instance, study authors highlighted the value of creatively using technology for data collection through “teasers and challenges,” which consisted of open-ended questions through text, music, or video formats to solicit adolescent response. Authors noted that this provided opportunities to enrich the data and offered flexibility in follow-up questions.

Obligations. To reap the benefits of technological use, study authors stressed the importance of having a network,

stakeholder buy-in, and funding (to pay participants for their time conducting data collection and analysis) when engaging young people in YPAR through online mediums. Study authors highlighted the importance of training adults (i.e., staff, research team members) in online facilitation to recognize, elevate, and promote adolescent participation throughout the data collection process, foster conversations to interpret the data, as well as attend to potential tensions or challenges within online spaces (e.g., cyberbullying). Notably, authors stressed the importance of training adult or program staff in creating an empowering and critical space for adolescents. Furthermore, study authors articulated the importance of being mindful of inequities in digital access and literacy and the need for strategic efforts in providing resources and supports to adolescent researchers.

Challenges. Challenges in obtaining rich dialog among young people (i.e., horizontal communication) not reliant on adult research team facilitation were reported in articles and phone discussions in four of the five projects. In particular, this trend occurred when key decisions in research design, analysis, or social action were required. Authors noted that YPAR design decisions in research focus, analysis, and social action were challenging to facilitate via technology. Several of the projects consisted of a hybrid design in which participants met regularly in-person and online. Study authors stressed the importance of the in-person meetings to reduce potential tensions, develop group norms, and engage in challenging decision-making processes. However, several authors that were connecting adolescents across large geographic spaces used the online platform Skype, which mimics the interpersonal dynamics of an in-person discussion.

Only Project 3 (Streetwyze, Oakland) solicited adolescent voice and perspective in the design of the online platform (a mobile Web application) and continually modified the platform based on user feedback. This was done to create a platform that could be accessed in adolescents' everyday lives. This particular project reported the least challenges in the uptake and use of the application by adolescents. Several team members well situated within the information and technology field had the expertise to continually modify and refine the online user interface. This intentionally diverse interdisciplinary research team allowed for needed modifications to the online interface and design. Several other study authors described identifying an ideal online platform based on adolescent input; however, when the project was implemented (several months later), adolescents were no longer using that particular platform (i.e., moving from Facebook to Instagram). Thus, several authors stressed the challenges in applying for funding that identified a particular platform (i.e.,

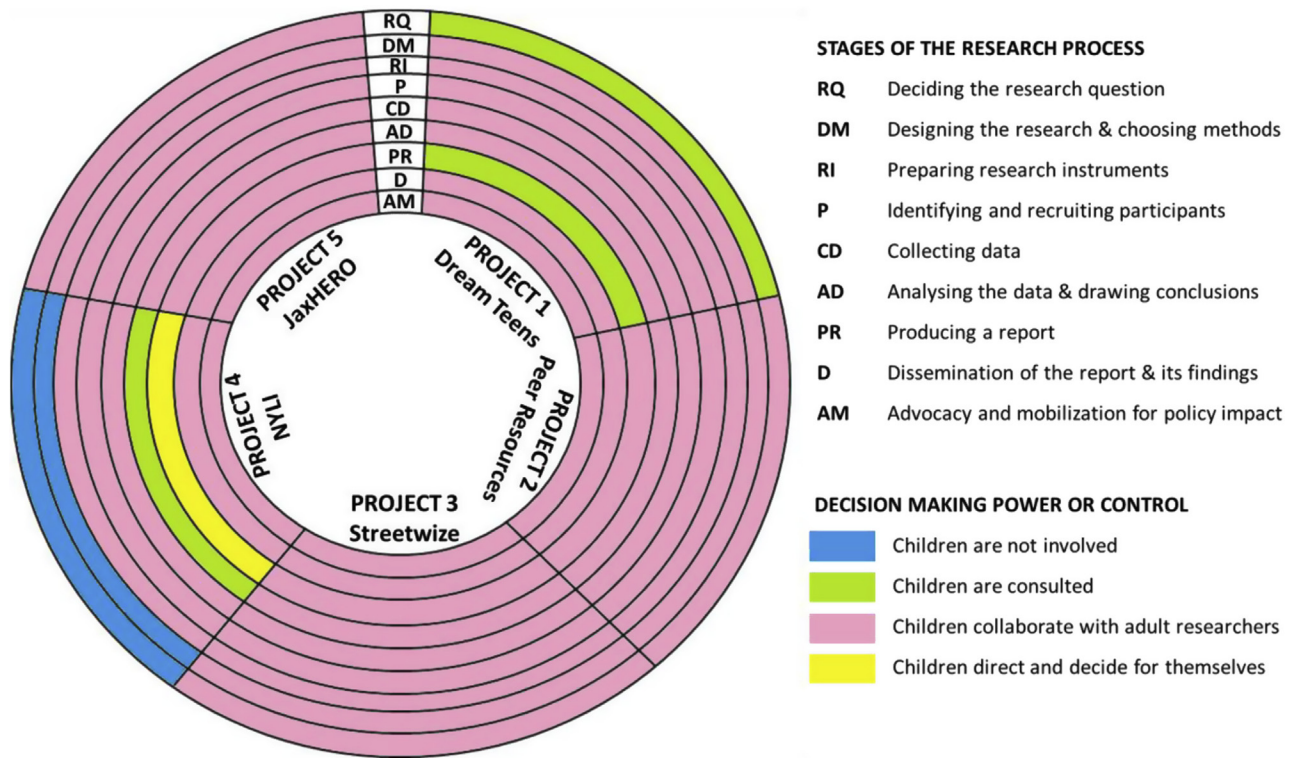


Figure 2. Appraisal of participatory approaches throughout project stages. Source: Author's representation, based on Shier's analytical tool [13].

Facebook) and the rapidly changing technological landscape and uptake of novel mediums (i.e., Instagram and Snapchat).

Appraisal of Participatory Approaches

Shier's analytical tool to help researchers develop partnerships with children and adolescents was used to assess the level of adolescent engagement at each stage of the projects (Figure 2). This was challenging based on published articles alone because they did not typically provide sufficient information on this aspect of YPAR. To address this gap, we gathered additional information through follow up phone discussions with the authors of the original YPAR studies included in this review. The appraisal showed that when adolescents were involved in the research process (specifically data collection, analysis, and advocacy), they mostly acted as collaborative researchers with adult guidance and support.

Study authors noted the benefits, challenges, and strategies in soliciting meaningful adolescent engagement and contribution to decision-making. As described below, two clear trends were noted throughout these conversations: (1) variation in meaningful adolescent participation within a singular YPAR project and (2) scaffolding adolescent participation within the project.

Variation in meaningful participation

It was challenging for some study authors to convey a clear sense of the participatory elements of the project at each research stage because it varied across the participants, YPAR groups, and project sites. It was also influenced by the medium of engagement and the adult support person involved. For instance,

in Project 2 (Peer Resources, San Francisco), teachers varied in adolescent engagement between classes, with some progressing the efforts of a former YPAR student group project, and others facilitating their first YPAR project. Thus, levels of adolescent engagement varied across sites and stages of the YPAR process, with one group being heavily involved in data analysis, whereas another engaged in problem identification. Thus, reflecting across the entire adolescent participant pool for Project 2, there were YPAR school-based groups occupying roles as active collaborators with adult researchers throughout each stage of the project. However, each school-based YPAR group did not achieve this status throughout, and the level, quality, and depth of the participation varied greatly. Project 4 (NYLI, West Virginia) showed a similar trend in that adolescent groups (130 total, with a range of 3–10 students per group) varied in their level of active participation in data collection. High-quality adolescent participation may have been influenced by the resources available (i.e., access to technology), skill set of the adult advisor, and relationships among the adolescents.

Scaffolding participation

Scaffolding adolescent engagement was identified as an important strategy, used by three of five projects to ensure quality participation and outcomes. In the projects reviewed, there was a smaller subgroup of adolescents engaged in meaningful high-level participation as co-collaborators. For instance, Project 1 (Dream Teens, Portugal) consisted of a smaller internal research team engaged throughout the YPAR process (N = 67) and actively polled a larger pool of students interested in sharing their perspectives surrounding issues impacting young people

throughout the country (N = 147). The authors stressed that this particular approach was critical to conducting YPAR while not being a burden on adolescents who did not have time to be highly involved. Furthermore, Project 3 (Steetwize, Oakland) developed the application and research objectives through a long-term partnership with two nonprofit organizations. Staff (also youth aged 18–25 years) helped in the design, development, and recruitment for the project. Next, high school students (recruited by youth staff) were engaged in testing the application and gathering valuable data for the project. Thus, the project had young people involved in each stage of the project, from determining the objects, to testing data collection methods. In Project 4 (NYLL, West Virginia), a smaller group of eight self-selected adolescents engaged in evaluating the qualitative data yielded from the online platform. Adolescents provided validity checks in data interpretation and analysis of the adult research team. It is notable that Project 2 (Peer Resources, San Francisco) and Project 5 (JaxHero, Florida) had the smallest number of adolescent co-researchers (N = 54 and N = 9, respectively) and thus may not have required the same logistics in securing meaningful adolescent engagement. The importance of providing opportunities for adolescents to partake in deeper, more engaging roles at various stages of the YPAR project was noted by study authors while still enabling adolescents to select their own level of engagement.

Discussion

The rapid spread of youth participatory politics through online media demonstrates the promise of digital technology to be used to scale up YPAR projects [8,32,37,63]. However, this systematic review highlighted the relative scarcity of peer-reviewed evidence on this topic despite proposals a decade ago for an e-PAR approach using technology and participatory action research to engage youth in health promotion [38] and more recent advocacy for YPAR 2.0 approaches [53].

In the small number of studies that did report the use of technology for scaling-up the scope of YPAR projects, there was a wide range of digital media and tools being used, primarily for data collection and dissemination. Technology was identified as particularly advantageous in data collection and exploration. Yet critical joint decisions in analysis, dissemination, and social action were reported to be challenging to facilitate via technology. These particular stages can be challenging to perform in-person and often benefit from the support of a series of guiding questions and adult support [39,64]. Thus, careful selection of technological platforms for different stages of the YPAR process may be particularly beneficial to match the exchange required (e.g., using Skype or Zoom for real-time discussions about data analysis and strategic action planning). Alternatively, preparatory work in-person could also be used to support adolescents in developing group norms and working through upcoming scenarios surrounding key decisions made within the online platform.

A key goal of YPAR is that it is empowering for those involved in the co-creation of new knowledge and subsequent action about health and well-being issues affecting them [25,65,66]. Studies of youth who use communication technology to be active in online political participation have demonstrated they are likely to have those experiences serve as a gateway into offline political participation [67,68]. Therefore, it is possible that online

involvement in YPAR could also progress to everyday involvement in health research and action.

It is incumbent on adult YPAR partners to adopt a reflexive approach to the YPAR processes to ensure the research environment is supportive and creates opportunities for adolescent agency without compromising their social, emotional, or physical safety [15]. Many frameworks and models have been developed to assist in this process [13,15,25,69–75]. However, this systematic review demonstrates that scaling up of YPAR projects introduces added complexities. YPAR projects with large numbers of adolescent researchers across multiple sites using different methods of communication may introduce greater variability in the level of engagement for adolescents in the research process and in the level and nature of adult support. The differing roles of the adults and the adolescents reflect the variability and challenges inherent in complex interventions [76], but the integrity of the YPAR approach is still an important consideration. Further research is needed to examine whether YPAR fidelity is more, less, or differentially applied with digitally based scaling. Drawing on impact and implementation assessments of YPAR projects can inform future efforts [39,77,78]. Arguably, the use of technology both increases opportunities for adolescents to contribute to decision-making and reduces the intensive interpersonal processes. It provides access to developmental opportunities but may also expose adolescents to potential risks in the online environment [1,2,6]. It may offer increased opportunities for adult oversight, documentation, and provision of support to adolescents but may also reduce the lead researcher's capacity to engage meaningfully with multiple project sites and with adult and adolescent contributors.

Our review of the extant literature suggests that strategically designing opportunities for high-level engagement throughout various stages of the YPAR project can increase adolescents' access to meaningful opportunities for participation. It highlighted the importance of being transparent about likely differences in experiences of the YPAR project, dependent on the form of participation. It also emphasized the potential need for capacity building for the adults involved to ensure consistency in YPAR approaches across multiple groups and sites [15]. However, it is also important to acknowledge that not all adolescents will want a high level of engagement and that disengagement and subversion of research processes can in themselves be a form of agency and assertion of adolescent rights [9,40,75].

Limitations and further research

The terminology used for this review's search terms, the search timeframe, and the restriction to peer-reviewed articles in English may have potentially missed relevant research projects. Future reviews could provide a broader examination of white papers, evaluations, and reports from organizations engaged in YPAR projects and publications in other languages. This review provides important initial insights to consider in future research to align with the rapid emergence of technological advances. It also highlights the need for rigorous assessment of differential impacts for adolescent participants in digitally scaled up YPAR projects.

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