



Trends of Positive Youth Development Publications (1995–2020): A Scientometric Review

Shaojie Qi¹ · Fengrui Hua¹ · Zheng Zhou¹ · Daniel T. L. Shek²

Received: 2 August 2020 / Accepted: 19 October 2020 / Published online: 25 October 2020
© The Author(s) 2020, corrected publication 2021

Abstract

In recent decades, the positive youth development approach has gained momentum among researchers and practitioners who focus on youth potential and adolescent well-being. In this study, 1435 academic works on positive youth development (PYD) are collected from the Web of Science using CiteSpace, reviewed and analyzed. First, the number, subject distribution, country, and institution of published papers are presented, and the author collaboration network involved in PYD is analyzed using network analysis. The results show that authors and institutions in Western societies are the main contributors to PYD research and that interdisciplinary collaboration is gradually growing. Using document co-citation analysis, research hotspots in the field were investigated. Furthermore, the research frontiers and trendy topics in PYD from 2010 to 2019 were found by using burst detection, and research gaps were identified. The findings provide research directions for future PYD studies in the field of applied quality of life research.

Keywords Scientometric analysis · Positive youth development · PYD · CiteSpace · Knowledge mapping

Introduction

Adolescent development involves a complex interaction of biological, psychological and social relations (Waid and Urich 2019). Adolescence is generally regarded as a period during which a person is at an increased risk of developing unhealthy and unsafe behaviors. Drug abuse, alcohol abuse, smoking, lack of exercise, unsafe sexual behavior, violence and injury and disability are common risks during adolescence (Johnson

✉ Shaojie Qi
qishaojie@swufe.edu.cn

¹ Research Institute of Social Development, Southwestern University of Finance and Economics, No. 555, Liutai RoadWenjiang DistrictChengdu 611130, People's Republic of China

² FHKPS, SBS, BBS, JP, Department of Applied Social Sciences, The Hong Kong Polytechnic University, Hong Kong, People's Republic of China

and Jones 2011; Kann et al. 2016). Scientific research on problems in adolescent development has been guided by a deficit model based on the notions of storm and stress (Hall 1904). According to this approach, adolescents are at risk, troubled by problems and threatened by inevitable psychological turmoil (Anthony 1969; Freud 1969). However, a new perspective based on positive youth development (PYD) began to emerge in the 1990's (Lerner et al. 2019). PYD stems from the criticism of the long-standing deficit model of adolescence and highlights healthy and holistic development rather than an emphasis on the reduction of problem behaviors, thereby redefining youth development from a more positive perspective (Lerner 2002, 2004).

Several PYD models have been proposed in the scientific literature (Shek et al. 2019). All PYD models focus on human potential, individual capability and plasticity (Shek et al. 2019), but they take slightly different forms; such models include Benson's model on external and internal developmental assets (Benson 2007), Lerner's 5Cs/6Cs model (Lerner 2006), social-emotional learning (SEL) and Catalano's 15 PYD constructs (Catalano et al. 2003). The 15 PYD constructs identified from effective PYD programs presented by Catalano et al. (2003) include several domains of psychosocial competencies, resilience, spirituality and prosocial involvement. PYD theories, research and applications are important for the promotion of quality of life in adolescents.

Over the past twenty-six years, PYD has inspired many studies, and researchers have carried out a great amount of research on the connotation, impact and measurement of PYD as well as PYD interventions in the field of applied quality of life (Shek et al. 2019; Zhou et al. 2020a). The PYD approach in the 1990s has had a far-reaching impact on the development of theory and practice in psychology, education, social services, social work, and public health. In addition, the growing interest of international organizations in PYD Research (UNICEF 2005, 2017; World Bank 2000, 2007) confirms the important role of PYD theory in global youth development (Lerner et al. 2019). Hence, an analysis of the collaboration network, hotspots, and frontiers in this field can inform scholars of the current state of science and help practitioners to develop programs that promote quality of life in young people, particularly through the promotion of psychosocial competence and life skills (Shek 2020). The related findings can also help policymakers to prioritize youth development policies and services. Therefore, the present study attempted to conduct a scientometric analysis on the development of the knowledge base of PYD field.

Although some review articles have provided an overview of PYD studies, they are limited in terms of region and research topics (Maslow and Chung 2013; Shek 2012; Shek et al. 2019; Waid and Urich 2020). Moreover, traditional reviews cannot quantitatively analyze the development of knowledge in a specific field from the vast literature. Furthermore, some of these reviews are qualitative in nature and thus prone to subjectivity. PYD is an interdisciplinary research field covering disciplines including psychology, education, social services, social work, and public health. Therefore, it is important to conduct a scientometric analysis based on a large bibliometric database that encompasses studies from the beginning of PYD research.

To address the abovementioned gaps, in this study, an in-depth scientometric review of PYD research is performed to map the knowledge structure and development trends of the PYD field. Scientometrics is the study of the inputs (e.g., researchers, research funds), outputs (e.g., papers, patents, periodicals) and processes (e.g., information dissemination, communication network) of scientific activities by using statistical and computational methods. Scientometric methods have been applied to knowledge

structure analysis, discipline evolution analysis, scientific output evaluation, and other methods in many disciplines (Aleixandre et al. 2019; Ekundayo and Okoh 2018; Wang et al. 2018). In recent years, the knowledge map combining information visualization technology with the citation analysis of traditional scientometrics has been widely used. Through data mining, information processing, and graphic production, the development of and relationships within scientific knowledge can be explored (Chen et al. 2008; Shiffrin and Borner 2004). In addition to giving researchers an overview of the work in a particular field, the findings can also provide possible directions for future research and PYD program development by referencing the gaps and deficiencies in the field.

The present study aims to answer three important questions through a scientometric analysis of PYD research. The first research question is as follows: Which countries/regions, institutions, and authors were most productive and influential in the field of PYD research? This question aims to determine the differences in progress between countries and regions and whether PYD is dominated by publications and academics in particular areas of the globe. The answer to this question is important because research in the social sciences has been criticized as “WEIRD” (participants are educated and from Western, industrial, rich democratic societies) (Nielsen et al. 2017). The second question is as follows: What are the research hotspots in this field, and how have they developed? This question aims to determine the topics and programs that have attracted the most attention in this area. The third question is as follows: What are the recent developmental trends and frontiers in PYD? This question aims to find the most popular articles published in recent years that will continue to impact the field in the near future. Answers to these questions are important for academic and applied research related to quality of life.

To answer the above questions, our review is guided by three key goals. The first goal is to determine the main contributors to PYD research by country/region, institution and author. The second goal is to make a knowledge map based on keywords and co-citation documents to understand the research hotspots in the field of PYD. The third goal is to make a knowledge map based on the perspective of burst references to reveal the research frontier and trend of PYD. Our study is different from previous review on PYD field in the following ways. First, we reviewed PYD research in a holistic manner rather than emphasizing on certain subfields. Second, we analyzed almost all relevant articles and reviews in the literature databases instead of focusing on key articles from specific journals. Third, to complement previous reviews, we employed a bibliometric visualization method to review PYD research.

Methods

Scientometric Analysis in CiteSpace

CiteSpace is a scientometrics tool that can be used to visualize knowledge. Compared with other visualization tools, it provides clearer and more interpretable visualizations by using various visualization analysis functions (Chen 2006). In recent years, CiteSpace has been widely used, not only in the information science field but also in psychology, education science, sociology, medicine, environmental science, and other disciplines (Chen et al. 2012; Guo et al. 2019; Jiang et al. 2019; Taskin and Aydinoglu 2015; Xu et al. 2020). It

can provide an extensive and in-depth understanding of the relevant research in a specific period to help researchers gain a better understanding of the overall nature of the field and to identify future research directions. Despite its popularity, CiteSpace has not been used to map global PYD research. To systematically review the research of PYD, three technologies of CiteSpace are used in this study: a) collaborative analysis, b) document citation analysis, and c) keyword co-occurrence analysis. These techniques are commonly used in other research in the field (Chen 2006; Wang et al. 2019).

Data Collection

According to previous research using CiteSpace visual analysis software (Chen et al. 2012; Niazi and Hussain 2011; Song et al. 2016; Yu 2015), the data collection process included two steps. The first step was to determine the data source. Web of Science (WoS) is considered to be the ideal data source for scientometric research (Van 2006). Therefore, we chose to search the core collection of WoS. The core collection included six online databases: SCI Expanded (1900-present), SSCI (1900-present), A & HCI (1975-present), CPCI-S (1990-present), CPCI-SSH (1990-present), and ESCI (2015-present). By searching the database using the term “positive-youth-development” from January 1900 to April 26, 2020, 1585 papers related to PYD were obtained. We further refined the search results by applying the following conditions: language = English; document type = article + review. The refined search returned 1436 documents, and these results were downloaded as text files of the form “full record and quoted documents” on April 26, 2020. After the 1436 pieces of literature were imported into CiteSpace, 1435 records were obtained as the final data of the knowledge map by using CiteSpace’s weight removal function. The references in these 1436 papers created a citation dataset of 47,635 records, including 34,735 original articles, 390 book chapters, 2210 review articles, and 10,690 other types of articles. The 47,635 citation dataset is used in the subsequent document co-citation analysis.

Analysis Plan

Based on the three research objectives of this paper, combined with the visualization map of CiteSpace, the collaborative network analysis, document co-citation analysis and keyword co-occurrence analysis are completed, and the research contributors, hotspots, frontiers and trends are obtained. The specific research plan is shown in Table 1.

Results

Current Status of Positive Youth Development Research

Research Outputs

The level of development of a discipline can be represented by the number of papers published in the area; in other words, an increase in the number of publications demonstrates an increase in the scientific knowledge of the field. Based on the literature retrieval process, which returned 1436 documents, a histogram of papers published in

Table 1 Analysis plan

Objective	Methods	Analyzing process	Outcome
To determine the main contributors of PYD research based on the places, institutions and authors involved	countries/regions collaboration network institution collaboration network author collaboration network category collaboration network	Identify the collaboration network by analyzing the different countries/regions, institutions, authors, and disciplines that coappeared in the same paper.	information on
To understand the research hotspots in the field of PYD	document co-citation analysis keyword co-occurrence analysis	Mine the co-citation relationship of the literature dataset by analyzing the frequency with which two items of earlier literature are cited together by the later literature. Analyze the keywords of the literature in the dataset and measure the relationship between them by analyzing the frequency of the cooccurrence of a group of keywords in a group of documents.	research hotspots
To make a knowledge map based on the perspective of burst references to reveal the research frontier and trend of PYD	document co-citation burst analysis	Identify the surge in the frequency of co-citation literature in a short period of time.	research frontiers and trends

the PYD field was created by using Excel (Fig. 1). Figure 1 shows the progress of papers published in the 26 years from 1995 to 2020 related to PYD. According to the annual change in the number of published papers, we divided the development of PYD into two stages. The first stage was from 1995 to 2005, when scholars had just begun to pay attention to PYD, and the number of published papers grew slowly. The second stage was from 2005 to 2020, when the number of published papers increased rapidly as PYD researched gradually deepened and expanded; this stage also promoted the development of the PYD field. The number of publications reached 194 in 2018 and 233 in 2019, indicating that PYD research gained momentum, and it seems like it will remain active in the next few years.

Research Categories

According to the analysis of the WoS database, we evaluated the publishing trends of disciplines involved in PYD research. We selected the top ten disciplines in terms of their involvement in the publication of PYD research (Table 2); the top disciplines are ranked as follows: psychology ($n = 731$); social sciences (other) ($n = 209$); public, environmental, and occupational health ($n = 193$); social work ($n = 175$); education

($n = 147$); family studies ($n = 139$); science/technology (other) ($n = 96$), sports sciences ($n = 87$), environmental sciences/ecology ($n = 75$) and pediatrics ($n = 70$). The distribution of subjects shows that psychology, social sciences, public, environmental, and occupational health, and education research were the most active in this field.

Research Journals

By searching PYD publications in WoS, we observed that more than 100 journals had published research related to PYD. We listed the ten journals with the most articles in Table 3. *The Scientific World Journal* (Multidisciplinary Sciences) is the leading academic journal in PYD research, publishing 91 articles from 1995 to 2020, followed by *Journal of Youth and Adolescence* (Psychology, Developmental) (65 publications), *Journal of Youth Development* (category unavailable) (48 publications), *Journal of Adolescent Research* (Psychology, Developmental) (41 publications), and *Journal of Adolescence* (Psychology, Developmental) (39 publications). The categorization was referred from the Journal Citation Reports 2018 of Web of Science. In general, the top journals mainly come from the area of developmental psychology.

The Collaboration Network of Positive Youth Development

Scientific collaboration analyzes scholars who cooperate to create scientific knowledge (Sylvan and Ben 1997). CiteSpace provides three main levels of collaboration analysis: macro-national collaboration (co-country/region), meso-institutional collaboration (coinstitution), and micro-author collaboration (coauthor). In this study, the evolution of interdisciplinary collaboration in the past 25 years was further analyzed. The collaboration network represents the degree of refinement of a research field. The more frequent the collaboration, the deeper the development. In practice, the collaboration network can serve as a useful guide for new researchers and for those seeking potential collaboration opportunities in the research areas of PYD.



Fig. 1 PYD trend from 1995 to 2020. In the past 26 years, 1436 articles on PYD were published in total in the core collection of WoS

Table 2 Top 10 ranking of publishing volume of PYD discipline

Subject	Count	%	Subject	Count	%
Psychology	731	50.91	Family Studies	139	9.51
Social Sciences-other Topics	209	14.55	Science Technology Other Topics	96	6.57
Public Environmental & Occupational Health	193	13.44	Sport Sciences	87	5.95
Social Work	175	11.98	Environmental Sciences Ecology	75	5.13
Education Educational Research	147	10.06	Pediatrics	70	4.79

Country/Regional Collaboration Network

To analyze collaboration among countries and regions, the parameters of the collaboration analysis in CiteSpace were set as follows: (1) time slices: 1995 to 2020, by year; (2) node type = country; (3) top 50 most frequent nodes from each slice; (4) pruning = default settings. The collaboration analysis focused on the principal countries/regions of research in the PYD field. The results showed that the number of papers published in PYD research differed by country/region. We found the top ten countries in terms of the number of published papers; the results are as follows: America, China, Canada, the United Kingdom, Australia, the Netherlands, Portugal, Italy, New Zealand, and Spain (Table 4). The United States, as the largest contributor, published 956 papers, followed by China, with 191 publications. Figure 2 shows a country collaboration network with 33 nodes and 91 edges, which means that 33 countries/regions have participated in the collaboration of PYD research. The node size in the collaboration map indicates the number of papers published by country/region, and the edges between nodes reflect collaboration between countries. A node with a purple outer ring has a high betweenness-centrality (BC) index, which indicates that the node has made significant collaborative contributions. BC ranges from 0 to 1, and the higher the value, the higher the contribution of the node. Nodes of high BC are usually regarded as key points in the

Table 3 Top 10 most publications journals of PYD

Journal	Count	%	Impact factor(2018)
Scientific World Journal (The Scientific World Journal)	91	6.34	1.46
Journal of Youth and Adolescence	65	4.53	3.26
Journal of Youth Development	48	3.34	3.26
Journal of Adolescent Research	41	2.86	3.96
Journal of Adolescence	39	2.72	2.35
Applied Development Science	36	2.51	1.84
Children and Youth Services Review	36	2.51	1.68
American Journal of Community Psychology	30	2.09	1.78
Journal of Adolescent Health	27	1.88	3.96
Journal of Research on Adolescence	24	1.67	2.07

field (Chen 2006). As shown in Fig. 2, the United States, Canada, and the United Kingdom had purple outer rings, which indicated that the three countries had a high impact on research in the field of PYD ($BC > 0.1$). In general, the development of PYD research requires global collaboration.

Institutional Collaboration Network

For the analysis of institutional collaboration, the parameters from the country collaboration network analysis were used; however, in this case, the node type was the institution. According to the results, 206 institutions have published research papers related to PYD. In Table 4, we list the top ten research institutions according to the number of published papers. Tufts University was the largest contributor, with 106 papers published, followed by 103 papers published by The Hong Kong Polytechnic University. Figure 3 shows the institutional collaboration network, which has 206 nodes and 457 edges. The larger the node, the more studies published by the institution. According to Fig. 3, there were many institutional collaborations within the United States and within East Asian countries/regions, but there were relatively few institutional collaborations between the Eastern and Western worlds. In addition, Tufts University, Boston University, and Pennsylvania State University had thick purple outer rings ($BC > 0.1$), which means that these institutions played an important role in the collaboration network.

Table 4 Top 10 most productive countries, institutions and authors

Country/ Region	Count	Institution	Count	Author	Count
American	956	Tufts University	106	Shek Daniel T.L.	118
China	191	The Hong Kong Polytechnic University	103	Lerner Richard M.	80
Canada	152	Kiang Wu Nursing College of Macau	62	Lerner Jacqueline V.	35
England	57	East China Normal University	61	Sun Rachel C.F.	35
Australia	41	Boston College	54	Bowers Edmond P.	25
Netherlands	24	University of California System	51	Scales Peter C	22
Italy	23	Chinese University of Hong Kong	48	Camiré Martin	20
Portugal	22	Pennsylvania Commonwealth System of Higher Education Pcshe	46	Geldhof G.John	20
New Zealand	20	University of Kentucky	46	Lee Tak Yan	19
Norway	18	State University System of Florida	41	Forneris Tanya	18

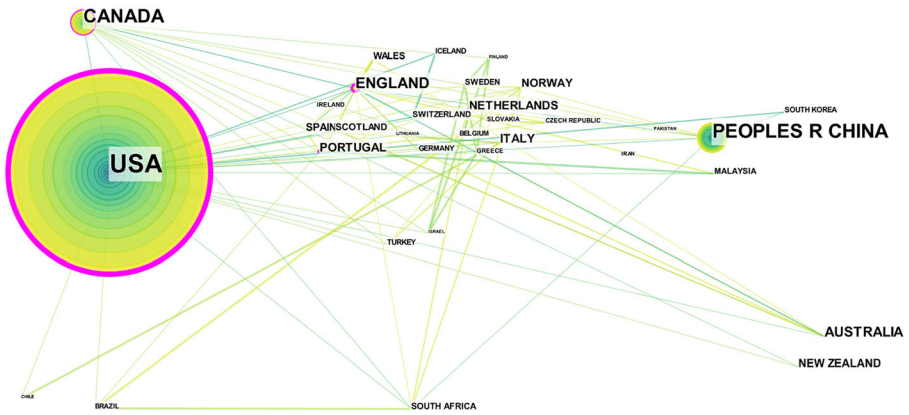


Fig. 2 Country/region collaboration network. During the past 26 years, 33 countries/regions participated in PYD research. Each node represents a country/region, and the size of the node indicates the number of publications of the country/region. Each edge indicates a collaborative relationship between countries/regions

Author Collaboration Network

For the analysis of author collaboration, the parameters from the country collaboration network analysis were used; however, in this analysis, the node type was the author. Table 4 lists the top 10 authors in PYD sorted by the number of published papers. Table 4 shows that Daniel T. L. Shek was the most prolific author in the field of PYD, contributing 118 articles, followed by Richard M. Lerner ($n = 80$), Jacqueline V. Lerner ($n = 35$), Rachel C. F. Sun ($n = 35$), Edmond P. Bowers ($n = 25$), and Peter C. Scales ($n = 22$). By analyzing the co-occurring author network, we found that scholars collaborate closely in this field (Fig. 4). The author's collaboration network, which consists of 255 authors and 552 links, is presented in Fig. 4. Three typical author groups, those led by Daniel T. L. Shek, Richard M. Lerner, and Martin Camiré, made up a portion of the research on PYD (Fig. 4).

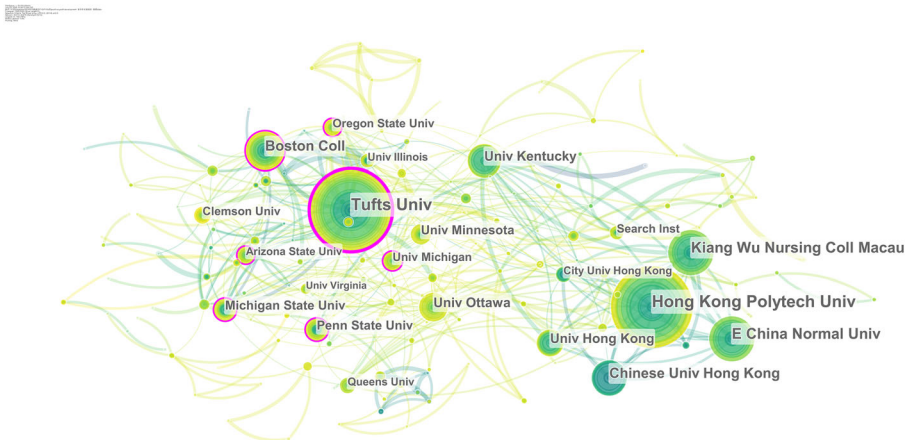


Fig. 3 Institution collaboration network. Over the past 26 years, 206 institutions participated in collaborative research on PYD. Each node represents an institution, and the size of the node indicates the number of publications of the institution. Each edge indicates a collaborative relationship between two institutions

The research group led by Daniel T. L. Shek launched a long-term PYD research project named “P.A.T.H.S. to Adulthood” to promote youth development in Hong Kong (Shek et al. 2010). To assess how young people in Hong Kong develop during the project period, they developed a Chinese Youth Positive Development Scale (CYPDS) with 80 items (Shek et al. 2007) based on the 15 PYD structures validated in successful PYD research projects in the United States (Catalano et al. 2004). It was found that CYPDS has good psychometric quality (Shek and Ma 2010). This scale is an attempt to apply PYD to Hong Kong, China, and it has been verified based on its applicability. The group also conducted longitudinal study on PYD development in adolescents in Mainland China (Zhou et al. 2020a, b).

The research team led by Richard M. Lerner and colleagues focused on the positive development of American adolescents and evaluated and revised the scale for measuring the Five Cs (Bowers et al. 2010; Geldhof et al. 2014; Lerner et al. 2005; Phelps et al. 2009). Lerner’s model used five characteristics related to positive youth functioning as Five Cs: competence, confidence, character, caring, and connection (Lerner et al. 2005). Lerner and colleagues then found another C, contribution, can be fostered in youth when they possess the characteristics of 5Cs (Lerner et al. 2005). The 5Cs were also found to be correlated with behavior problems in early adolescence (Jelicic et al. 2007).

Martin Camiré and colleagues integrated a PYD framework into physical activity programs. Through his research, Camiré examined how PYD could be facilitated in the context of sports (Bean et al. 2018; Camiré and Santos 2019; Santos et al. 2018). Camiré also studied the role of coaches in the promotion of positive development and the transfer of life skills (e.g., leadership and decision-making) to young sports participants (Santos et al. 2019). From a PYD perspective, Camiré’s focused on intervention, health promotion, and research methods and successfully applied PYD to sports.

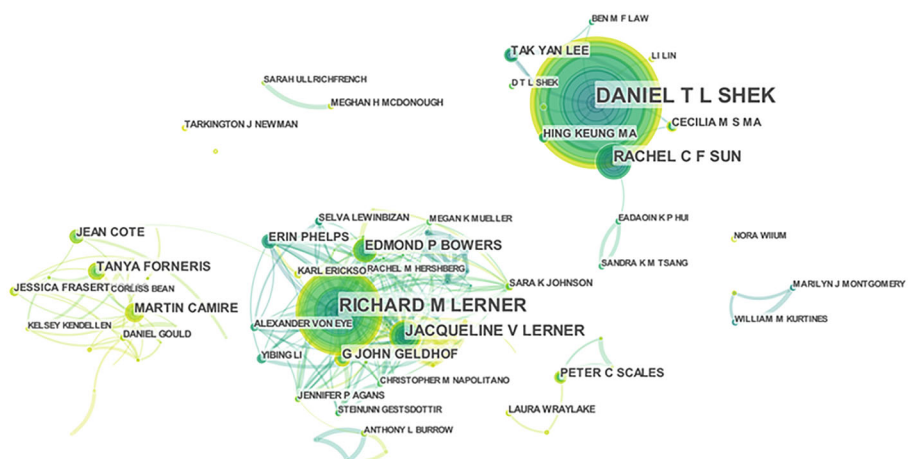


Fig. 4 Author collaboration network. Over the past 26 years, 255 authors have participated in collaborative research on PYD. Each node represents an author, and the size of the node indicates the number of publications of the author. Each edge indicates a collaborative relationship between two authors

Category Collaboration Network

In addition to analyzing the overall interdisciplinary collaboration network, we were interested in determining how the interdisciplinary collaboration network evolved over time. Therefore, we evaluated the evolution of cross-disciplinary collaboration every five years based on the 200 most frequently occurring nodes. The parameters used in the collaboration analysis in this case were as follows: (1) time slices: 1995 to 2019, every 5 years; (2) node type = category; (3) top 200 most frequent nodes from each slice; (4) pruning = default settings. Figure 5 shows the cross-disciplinary collaboration of PYD in the past 25 years. The results showed that PYD research has become more interdisciplinary over time. Although PYD research has been predominantly performed in the area of psychology in the past 25 years, cross-disciplinary collaboration of PYD has changed over time. In the first five years of exploration of this field (1995–2000), studies in psychology and other disciplines such as education and social work were relatively independent. Starting in the twenty-first century, researchers in psychology began collaborating with those in fields such as public, environmental and occupational health and pediatrics. From 2005 to 2009, the collaboration network became more complex and more diverse, and even small-scale discipline such as hospitality started to cooperate with other disciplines. With the rapid increase in the publication of PYD since 2010, the collaboration network has continued to expand and accelerate significantly. In the last five years, psychology, social work, environmental science and ecology, public, environmental and occupational health, and family studies were the most active areas in terms of interdisciplinary collaboration.

Intellectual Landscape of Positive Youth Development

This section introduces a rigorous analytical framework for integrating keyword co-occurrence and literature co-citation to determine research hotspots, research trends, and frontiers in the field of PYD.

Keyword Co-Occurrence Analysis

Keywords are used to summarize the content of a paper. Useful information, such as objectives, methods, and viewpoints, can be obtained from the keywords of a publication (Tian et al. 2018). Therefore, frequency analysis of keywords is critical for investigating hot topics and developments in a given field (Wang et al. 2018). The co-occurrence analysis of CiteSpace mainly included two steps: (1) extract keywords and calculate the frequency of keywords through classification, and (2) perform keyword co-occurrence analysis by obtaining the co-occurrence matrix of the extracted keywords (Chen 2004, 2006). The keywords used in the analysis included “Author Keywords” provided by authors and “Keywords Plus” provided by journals. The parameters of co-occurrence analysis in this case were as follows: (1) time slices: from 1995 to 2020, by year; (2) node type = keyword; (3) the top 50 most frequent nodes from each slice; (4) pruning = default settings. The knowledge map generated under these settings consisted of 289 nodes and 2437 links (Fig. 6). The co-occurrence network of PYD keywords included two critical features: frequency and BC.

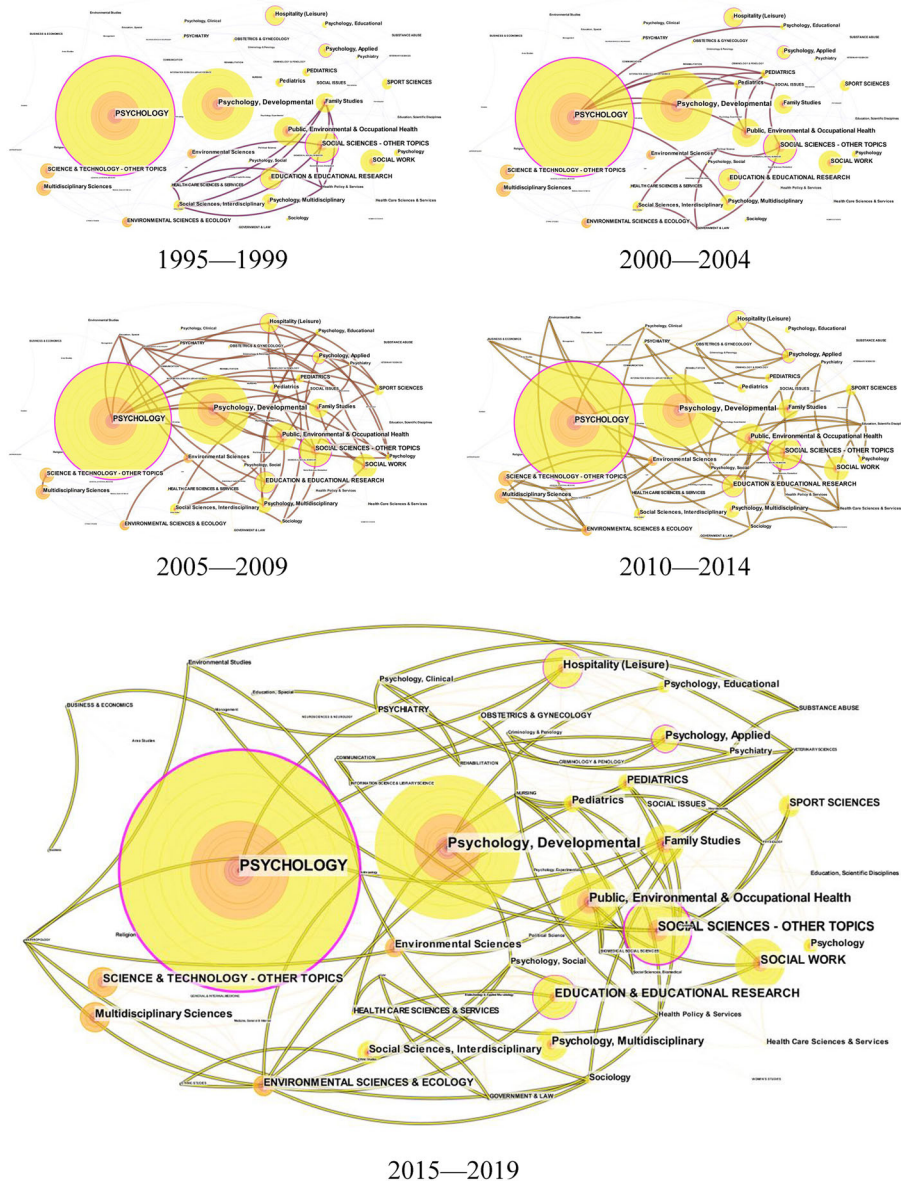


Fig. 5 Category collaboration network. Each node indicates a category, and the larger the node, the more papers were published. Each edge indicates a collaborative relationship between two categories

Frequently occurring keywords were represented by bigger nodes. A keyword with a high BC value plays an important role in linking other keywords in the network graph

The top two keywords in terms of co-occurrence frequency (Table 5) were “positive youth development” ($n = 843$; $BC = 0.12$) and “adolescent” ($n = 376$; $BC = 0.06$). Teenagers were the main subjects of PYD research. The keywords “adolescent” “program” “behavior” “prevention” “risk” “school” and “participation” had high BC values which indicates that these nodes played an important role within the keyword

Table 5 Top 20 keywords with the highest counts of PYD

NO.	Count	BC	Keyword	NO.	Count	BC	Keyword
1	843	0.12	positive youth development	11	123	0.04	experience
2	376	0.06	adolescent	12	121	0.07	school
3	188	0.04	program	13	108	0.07	youth
4	186	0.04	children	14	104	0.05	impact
5	170	0.05	participation	15	103	0.05	intervention
6	170	0.04	behavior	16	102	0.01	sport
7	168	0.11	adolescence	17	88	0.08	mental health
8	138	0.01	prevention	18	85	0.02	substance use
9	134	0.04	risk	19	83	0.06	model
10	130	0.05	health	20	79	0.04	resilience

average Silhouette S of 0.2601 ($S < 0.3$) is relatively low and due mainly to the numerous small clusters.

Burst detection is a useful research method because it can help scholars to identify topics that attracted special attention in a certain period of time (Zhou et al. 2018). Therefore, we generated a total of 220 burst articles by using the reference co-citation analysis of CiteSpace. Table 8 presents 20 references with the strongest citation bursts. A reference is said to burst if it experiences a sharp increase in citation frequency (Zhou et al. 2018). Table 9 presents references with recent bursts. Such references can be used to investigate research frontiers and predict research trends (Liu et al. 2019).

Discussion

Collaboration Network of Positive Youth Development Research

In recent years, the importance of scientific cooperation has been increasingly recognized. Through scientific collaboration, complex scientific problems can be solved and knowledge creation can be promoted (Sonnenwald 2007). Collaboration analysis is essential for understanding academic exchange and knowledge diffusion (Chen 2006). To provide a collaboration network and academic influences on PYD research, four types of collaboration analysis were applied in this study: country analysis, institution analysis, author analysis, and interdisciplinary analysis.

This study showed that scientific publications on PYD research were primarily performed in America, China, and Canada. The most productive institutions came from China and the US, confirming the importance of their contributions to PYD. This finding is consistent with the WEIRD phenomenon mentioned above. The Hong Kong Polytechnic University and Tufts University were the most productive and influential institutions because they published the most articles and had high BC values. Meanwhile, institutions from Asian countries have been increasingly

Table 6 Top 10 reference with most co-citation of PYD

Author	Year	Journal	Counts co-citation	Reference
Richard M. Lerner	2005	Journal of Early Adolescence	100	Positive Youth Development, Participation in Community Youth Development Programs, and Community Contributions of Fifth-Grade Adolescents: Findings from the First Wave of the 4-H Study of Positive Youth Development
Edmond P. Bowers	2010	Journal of Youth and Adolescence	74	The Five Cs Model of Positive Youth Development: A Longitudinal Analysis of Confirmatory Factor Structure and Measurement Invariance
Peter L. Benson	2007	Handbook of Child Psychology	59	Positive Youth Development: Theory, Research, and Applications
Jacquelynne S Eccles	2003	Journal of Social Issues	56	Extracurricular Activities and Adolescent Development
Holt, Nicholas L.	2017	International Review of Sport & Exercise Psychology	55	A Grounded Theory of Positive Youth Development Through Sport Based on Results from a Qualitative Meta-study
Damon, W	2004	Annals of the American Academy of Political and Social Science	47	What is Positive Youth Development?
Joseph A. Durlak	2011	Child Development	47	The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions
Phelps E. 47	2005	Journal of Applied Psychology The structure and developmental course of Positive Youth Development (PYD) in early adolescence: Implications for theory and practice.	47	Developmental Psychology
Richard M. Lerner.	2004	The Journal of Early Adolescence	45	Positive Youth Development - A View of the Issues.
Peter L. Benson	2011	Advances in Child Development & Behavior	44	The contribution of the developmental assets framework to positive youth development theory and practice.

interested in PYD research. There was close cooperation between institutions within countries (regions) such as the United States and China. However, transnational cooperation between Eastern and Western institutions was relatively rare. Three prominent authors formed three leading research groups. However, we found that the collaborative relationships among the three research groups were not strong. Daniel T. L. Shek and Richard M. Lerner were the most productive and high-impact authors of PYD research, but there was no direct collaboration. Interdisciplinary cooperation was rare at the beginning of the period we investigated, but recently, it has begun to flourish and cover more areas. In the last five

Table 7 Top 10 reference with the highest BC of PYD

Author	Year	Journal	Counts co- citation	Reference
Shek D. T L.	2010	Social Indicators Research	0.08	Quality of Life of Chinese People in a Changing World “Using Students” Weekly Diaries to Evaluate Positive Youth Development Programs: Are Findings Based on Multiple Studies Consistent?
Geldhof, G. J.	2014	Journal of Research on Adolescence.	0.08	Creation of short and very short Measures of the five Cs of Positive youth Development.
Hilliard, Lacey J.	2014	Journal of Youth & Adolescence	0.08	Beyond the Deficit Model: Bullying and Trajectories of Character Virtues in Adolescence
Richard M. Lerner	2005	Journal of Early Adolescence	0.06	Positive Youth Development, Participation in Community Youth Development Programs, and Community Contributions of Fifth-Grade Adolescents: Findings from the First Wave of the 4-H Study of Positive Youth Development
Jacquelynne S Eccles	2003	Journal of Social Issues	0.05	Extracurricular Activities and Adolescent Development
Cohen, Jonathan	2009	Teachers College Record	0.05	School Climate: Research, Policy, Practice, and Teacher Education
Damon, W	2004	Annals of the American Academy of Political and Social Science	0.05	What is Positive Youth Development?
Richard M. Lerner	2005	Journal of Early Adolescence	0.04	Positive Youth Development - A View of the Issues
DuBois, David L.	2011	Psychological Science in the Public Interest	0.04	How Effective Are Mentoring Programs for Youth? A Systematic Assessment of the Evidence
Nansook Park	2004	Annals of the American Academy of Political and Social Science	0.04	The Role of Subjective Well-being in Positive Youth Development

years, psychology, social work, environmental science and ecology, public, environmental and occupational health, family studies were active areas in terms of interdisciplinary collaboration. Interdisciplinary cooperation should remain a trend in future research on PYD.

Research Hotspots of Positive Youth Development

We identified the hot topics of PYD by analyzing keywords and co-citation clusters in the present study. The hotspots are discussed in terms of the definition of PYD, the evaluations of PYD, and the theoretical exploration of PYD.

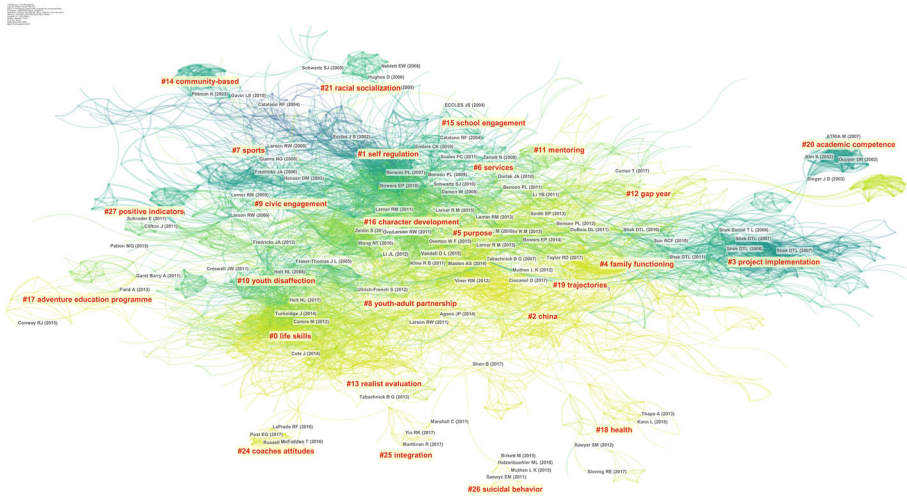


Fig. 7 Document co-citation clustering network. A total of 27 clusters were generated in the graph. Each node represents one cited reference, and each edge indicates the co-citation relationship. The color represents the date of publication: yellow indicates literature that is newly published, and green and blue indicate literature published in early years

The Definition and Connotation of PYD

PYD is a broad concept with rich connotations. Several researchers have proposed definitions according to their different emphases. First, Damon (2004) pointed out that PYD focuses on the potential of individuals and pays attention to talent, strength, interest, and potential, instead of ability defects. Hamilton et al. (2004) developed and expanded this definition and expounded the PYD concept to include the development process, methods and principles, and practice. Catalano et al. (2004) combined existing research and proposed a definition for development goals/outcome orientation that included 15 aspects of goals: connection, resilience, behavioral capacity, social capacity, emotional competence, cognitive ability, moral capacity, self-determination, spiritual intelligence, self-efficacy, clear and positive identity, hope for the future, positive behavior recognition, prosocial activity participation, and prosocial norms. Lerner et al. (2005) also defined PYD as a developmental striving toward being full, healthy, and successful. However, conceptions of PYD are primarily based on Western concepts and there have been few attempts to integrate the related concepts across cultures.

Evaluation Methods of PYD

The evaluation of PYD has remained a concern of scholars. The evaluation of PYD has gone from the initial qualitative research and exploration of questionnaires on some dimensions of PYD to a mature measurement tool. However, because there are several definitions and structures of PYD, researchers often adopt different questionnaires. It is common now to use multi-index independent measurement or multidimensional comprehensive measurement. With multi-index independent measurement, two or more PYD indexes are adopted to conduct independent measurements. Among them, the 5Cs structure, which includes five dimensions (i.e., ability, self-confidence, connection,

Table 8 Top 20 references with the strongest citation bursts

No.	Strength	Author	Year	Reference	Begin	End
1	31.31	Lerner R.M.	2005	Positive Youth Development - A View of the Issues.	2005	2013
2	28.58	Eccles J.S.	2002	Extracurricular Activities and Adolescent Development.	2004	2010
3	17.67	Damon W.	2004	What is Positive Youth Development?	2007	2012
4	17.52	Holt N.L.	2017	A Grounded Theory of Positive Youth Development Through Sport Based on Results from a Qualitative Meta-study.	2018	2020
5	16.26	Catalano R.F.	2004	Raising Healthy Children Through Enhancing Social Development in Elementary School: Results After 1.5 Years.	2009	2012
6	16.25	Roth J.L.	2003	Youth Development programs: Risk, Prevention and Policy.	2005	2011
7	16.22	Lerner R.M.	2004	Positive Youth Development - A View of the Issues.	2005	2012
8	15.51	Shek D.T.L.	2007	A Longitudinal Study of Perceived Parental Psychological Control and Psychological Well-being in Chinese Adolescents in Hong Kong.	2007	2010
9	14.45	Shek D.T.L.	2007	The Chinese Positive Youth Development Scale: A Validation Study.	2007	2010
10	13.23	Shek D.T.L.	2006	Effectiveness of the Tier 1 Program of the Project PATHS: Preliminary Objective and Subjective Outcome Evaluation Findings.	2007	2010
11	12.86	Benson P.L.	2007	The Definition and Preliminary Measurement of Thriving in adolescence.	2009	2015
12	12.15	Carson S.	2008	Life Skills Development Through Sport: Current Status and Future Directions.	2012	2016
13	11.54	Larson R.W.	2000	Toward a psychology of positive youth development.	2003	2008
14	11.39	Shek D.T.L.	2010	Objective Outcome Evaluation of the Project PATHS in Hong Kong: Findings Based on Individual Growth Curve Models.	2011	2012
15	11.04	Shek D.T.L.	2006	Adolescent developmental issues in Hong Kong: Relevance to Positive Youth Development Programs in Hong Kong.	2006	2012
16	10.95	Shek D.T.L.	2011	Prevention of Adolescent Problem Behavior: Longitudinal Impact of the Project P.A.T.H.S. in Hong Kong.	2012	2013
17	10.62	Shek D.T.L.	2007	Subjective outcome evaluation of the project P.A.T.H.S.: secondary analyses of the qualitative data collected from program implementers.	2008	2010
18	10.58	Gestsdóttir S.	2007	Intentional self-regulation and positive youth development in early adolescence: Findings from the 4-h study of positive youth development.	2009	2011
19	10.58	Shek D.T.L.	2006	EDITORIAL: Construction of a positive youth development project in Hong Kong.	2007	2010
20	10.37	Shek D.T.L.	2007	Subjective Outcome Evaluation of the Project P.A.T.H.S: Descriptive Profiles and Correlates.	2008	2010

Table 9 Recent burst references (2015–2020)

No.	Strength	Author	Year	Reference	Begin	End
1	4.15	Weiss M.R.	2013	Qualitative Research in Sport, Exercise and Health.	2015	2020
2	3.35	Trottier C.	2014	Fostering Life Skills Development in High School and Community Sport: A Comparative Analysis of the Coach's Role.	2015	2020
3	4.93	Holt N.L.	2011	A Grounded Theory of Positive Youth Development Through Sport Based on Results from a Qualitative Metastudy.	2016	2020
4	3.87	Benson P.L.	2011	The contribution of the developmental assets framework to positive youth development theory and practice.	2016	2020
5	3.53	Strachan L.	2011	A new view: exploring positive youth development in elite sport contexts.	2016	2020
6	3.41	McDonough M.H.	2013	Social Responsibility among Low-Income Youth in Physical Activity-Based Positive Youth Development Programs: Scale Development and Associations with Social Relationships.	2016	2020
7	9.41	Turnidge J.	2014	Positive Youth Development From Sport to Life: Explicit or Implicit Transfer?	2017	2020
8	7.56	Roth J.L.	2016	Evaluating youth development programs: Progress and promise.	2017	2020
9	6.10	Camire M.	2012	Coaching and Transferring Life Skills: Philosophies and Strategies Used by Model High School Coaches.	2017	2020
10	4.26	Hellison D.	2011	Teaching Personal and Social Responsibility Through Physical Activity-3rd Edition.	2017	2020
11	3.95	Chinkov A.E.	2016	Implicit Transfer of Life Skills Through Participation in Brazilian Jiu-Jitsu.	2017	2020
12	3.65	Armour K.	2013	Positive youth development through an outdoor physical activity programme: evidence from a four-year evaluation.	2017	2020
13	3.48	Allen G.	2015	Enablers and barriers for male students transferring life skills from the sports hall into the classroom.	2017	2020
14	3.34	Camire M.	2013	A Case Study of a High School Sport Program Designed to Teach Athletes Life Skills and Values.	2017	2020
15	17.52	Holt N.L.	2017	A grounded theory of positive youth development through sport based on results from a qualitative meta-study.	2018	2020
16	8.86	Bean C.	2016	Examining the Importance of Intentionally Structuring the Youth Sport Context to Facilitate Positive Youth Development.	2018	2020
17	8.75	Taylor R.D.	2017	Promoting Positive Youth Development Through School-Based Social and Emotional Learning Interventions: A Meta-Analysis of Follow-Up Effects.	2018	2020
18	7.81	Holt N.L.	2016	Positive Youth Development through Sport. (Second Edition).	2018	2020
19	7.60	Pierce S.	2017	Definition and model of life skills transfer. 2018	2018	2020
20	6.30	Smith B.	2018	Developing rigor in qualitative research: problems and opportunities within sport and exercise psychology.	2018	2020
21	4.33	Ciocanel O.	2017	Effectiveness of Positive Youth Development Interventions: A Meta-Analysis of Randomized	2018	2020

Table 9 (continued)

No.	Strength	Author	Year	Reference	Begin	End
				Controlled Trials.		
22	4.33	Bean C.	2017	Is Life Skill Development a By-Product of Sport Participation? Perceptions of Youth Sport Coaches.	2018	2020
23	3.93	Tabachnick B.G.	2013	Using Multivariate Statistics.	2018	2020
24	3.80	Tolan P.	2016	Toward an integrated approach to positive development: Implications for intervention.	2018	2020
25	3.54	Coakley J.	2016	Positive Youth Development through Sport: Myths, beliefs, and realities.	2018	2020
26	3.42	Lerner R.M.	2014	Using relational developmental systems theory to link program goals, activities, and outcomes: The sample case of the 4-H Study of Positive Youth Development.	2018	2020

character, and care), is one of the most commonly used tools (Lerner et al. 2005). The scale has a solid theoretical basis and a refined structure, with good reliability and validity that has been verified via long-term follow-up study. Furthermore, an abridged version and a super-abridged version have been developed, and these versions are very applicable and generalizable (Geldhof et al. 2014). In addition to assessment, evaluation studies of PYD programs in Hong Kong (Ma et al. 2019) and mainland China (Zhu and Shek 2020) are becoming more common.

Related Theoretical Exploration of PYD

As research continues to develop, a theoretical basis of PYD is being formed. Its theoretical core is based on the following three questions: how to conceptualize PYD; how to promote PYD; and the mechanism of promoting PYD. Therefore, the development of the relevant theories of PYD draws from the key concepts of developmental system theory and develops a series of key ideas covering the interaction between individual and environment and the realization of optimal development based empirical evidence. Resilience (Lerner et al. 2013; Leipold and Greve 2009; Masten 2007), developmental assets (Benson 2007; Sesma et al. 2005), developmental contextualism (Bronfenbrenner 2001; Lerner 2006) and relational developmental systems (Bateson and Gluckman 2011; Lerner 2006; Overton 2013) have been PYD research hotspots for the past few years.

Psychosocial Intervention and Educational Practice

The scientific intervention of PYD emphasizes the promotion of the resources of individual and environment (e.g., family, school, community) and the enhancement of the positive interaction between individual and environment. Youth development institutions have carried out influential long-term PYD promotion programs in recent years. The 4H program in the United States is the most influential of such programs. The program aims to improve civic awareness, leadership, responsibility and life skills

and focuses on the positive development of the youth through long-term follow-up study (Lerner et al. 2009). In addition, the Changing Lives Program of Florida International University helped youth to deal with behavioral and emotional problems, to form perfect self-identity, and to set academic and career goals to promote positive development (Eichas et al. 2010). The program focuses on solving problems and fostering skills and advantages to promote full development. The P.A.T.H.S. program in Hong Kong is a PYD intervention program in the Chinese cultural context. The program has developed a curriculum-based PYD promotion program for junior high school students in Hong Kong, China. It integrated various resources including research institutions, all levels of government, schools, and nongovernmental institutions and highlights the 5 Ps (program, people, process, policy, and place) to ensure quality and implementation (Shek and Sun 2013). The program is a good example of the organic integration of PYD theory, scientific intervention, and educational practice.

Research Frontiers of Positive Youth Development

In this paper, the development trends and future directions of PYD research were evaluated by using literature co-citation analysis. The PYD research trends from 2005 to 2010 focused on the concept of PYD (Damon 2004; Lerner et al. 2005) and measurement evaluation methods (Shek et al. 2007; Shek 2007). From 2011 to 2015, the focus shifted the evaluation of programs in different institutions, such as 4H (Lerner et al. 2009) and P.A.T.H.S. (Shek 2007). From 2016 to 2020, the theory of PYD gradually diversified and focused on development assets (Benson et al. 2011), social emotions (Durlak and Dupre 2008), etc.; furthermore, through practical projects, the Five Cs model was developed (Bowers et al. 2010). In addition, some researchers have focused on the development of teenagers during sports programs (Bean and Forneris 2016). In short, PYD research has shifted from basic theoretical studies on the developmental resources and structures to practical applications of intervention programs.

Moreover, we regarded references that underwent significant bursts within the past five years (2015–2020) as the newest PYD research frontiers. The 26 recent burst references in Table 9 include Holt et al. (2017), Jennifer et al. (2014), Camiré et al. (2013), Benson et al. (2011), and Tolan et al. (2016); these references are expected to continue to be important in the future because bursts are usually a predictor of subsequent research trends (Fu et al. 2019). The focus on applied PYD is important because PYD attributes positively influence adolescent development (Shek 2020), including academic adjustment (Shek and Chai *in press*).

Research Gaps in Positive Youth Development Research

Although PYD research has been fruitful and has underwent theoretical refinement, there are two research gaps. First, the research has been dominated by Western researchers and institutions. The most productive authors and institutions were from Western countries, and the findings and evaluations were mainly based on Western children and adolescents. Because the PYD models were mostly developed in Western contexts (Shek et al. 2019) and culture is an important dimension of positive youth (Benson et al. 2006), it is necessary to conduct more research in non-Western contexts.

According to Wiium and Dimitrova (2019), researchers should consider the context in which young people live to ensure the generalization of developmental assets. In recent years, a group of researchers in Hong Kong applied the PYD model in the Chinese cultural context (Shek et al. 2007; Shek et al. 2010; Shek et al. 2019; Zhou et al. 2020a, b). However, research on children from other cultural backgrounds is still lacking. It is important to focus on cultural diversity in future PYD research if we wish to apply Western PYD theories and models to promote the quality of life in adolescents in non-Western contexts.

Second, knowledge from different disciplines must be integrated. Although PYD has been studied for more than 20 years, large-scale interdisciplinary collaboration began only in recent years. As Cantor et al. (2018) and colleagues argued, a holistic understanding of youth development requires the integration of psychology, biology, neuroscience, and other social sciences. Cross-disciplinary collaboration is needed to fully utilize the breadth and depth of the available knowledge. In the last decades, since the importance of interdisciplinary work has been increasingly recognized, interdisciplinary research is becoming more common (Noorden 2015). As Noorden (2015) pointed out, interdisciplinary research has a longer-term impact than non-interdisciplinary studies. Therefore, interdisciplinary collaboration and integration is crucial for PYD research.

Conclusion

To the best of our knowledge, this study is the first scientometric analysis of the global PYD research carried out over the past two decades. Using the databases from WoS, we found that PYD research has attracted increasing attention from researchers in different disciplines. We used several methods via CiteSpace to address three research questions, and the investigation included the following: (1) the countries/regions, institutions, and authors that most contributed to PYD research were recognized, and the development of interdisciplinary collaboration was analyzed by using the collaboration network method; (2) the combination of document co-citation analysis and keyword co-occurrence analysis revealed the hotspots and research trends of PYD research; and (3) the research frontiers and trends of PYD were examined by using document co-citation burst analysis. The visualization tools offered an in-depth understanding of the knowledge map of PYD. These results provide information that is valuable to PYD researchers and practitioners.

However, there are some limitations of this study. First, we used only six online databases and thus this study might not consider all PYD studies. Second, “positive-youth-development” was used as the only search term; this method could be improved. For example, some researchers might use the term “social-emotional learning” instead of PYD in their studies, even though such studies are within the scope of PYD. Therefore, future studies should use more flexible keywords to search the databases. Third, the collaboration network analysis focused on journal articles and reviews, as books and book chapters were not covered in the database. Furthermore, some organizations have published work in the form of reports and web-based information. Therefore, future studies could incorporate more diverse sources for the scientometric analysis.

Funding This research was supported by “the Fundamental Research Funds for the Central Universities”, Southwestern University of Finance and Economics (Grant Number: 330600004007000006).

Compliance with Ethical Standards

•**Conflict of Interest** The authors declare that they have no conflict of interest.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Aleixandre-Benavent, R., Aleixandre-Tudó, J. L., Castelló-Cogollos, L., & Aleixandre, J. L. (2019). Trends in scientific research on climate change in agriculture and forestry subject areas (2005–2014). *Journal of Cleaner Production*, *147*, 406–418.
- Anthony, E. J. (1969). The reactions of adults to adolescents and their behavior. In G. Caplan & S. Lebovici (Eds.), *Adolescence: Psychosocial perspectives* (p. 2017). New York: Basic Books.
- Bateson, P., & Gluckman, P. (2011). *Plasticity, development and evolution*. Cambridge: Cambridge University Press.
- Bean, C., & Forneris, T. (2016). Examining the importance of intentionally structuring the youth sport context to facilitate positive youth development. *Journal of Applied Sport Psychology*, *28*(4), 140–425.
- Bean, C., Kramers, S., Camiré, M., Fraser-Thomas, J., & Forneris, T. (2018). The program quality assessment in youth sport (PQAYS) measure development: Initial validity and reliability evidence. *Cogent Social Sciences*, *4*, 1–35.
- Benson, P. L., Scales, P. C., Hamilton, S. F., & Sesman, A. (2006). Positive youth development: Theory, research and applications. In R. M. Lerner (Ed.), *Handbook of clinical psychology: Theoretical models on human development* (Vol. 1, pp. 894–941). New York: Wiley.
- Benson, P. L. (2007). Developmental assets: An overview of theory, research, and practice. In R. K. Silbereisen & R. M. Lerner (Eds.), *Approaches to positive youth development* (pp. 33–58). America: SAGE Publications Ltd..
- Benson, P. L., Scales, P. C., & Syvertsen, A. K. (2011). The contribution of the developmental assets framework to positive youth development theory and practice. *Advances in Child Development & Behavior*, *41*(18), 197–230.
- Bowers, E. P., Li, Y., Kiely, M. K., Brittan, A., Lerner, J. V., & Lerner, R. M. (2010). The five Cs model of positive youth development: A longitudinal analysis of confirmatory factor structure and measurement invariance. *Journal of Youth & Adolescence*, *39*(7), 720–735.
- Bronfenbrenner, U. (2001). The bioecological theory of human development. In Author (Ed.), *Making human beings human: Bioecological perspectives on human development* (pp. 3–15). Thousand Oaks: Sage Publications.
- Camiré, M., Trudel, P., & Bernard, D. (2013). Coaching and transferring life skills: Philosophies and strategies used by model high school coaches. *Sport Psychologist*, *27*(2), 188–200.
- Camiré, M., & Santos, F. (2019). Promoting positive youth development and life skills in youth sport: Challenges and opportunities amidst increased professionalization. *Journal of Sport Pedagogy & Research*, *5*, 27–34.
- Cantor, P., Osher, D., Berg, J., Steyer, L., & Rose, T. (2018). Malleability, plasticity, and individuality: How children learn and develop in context. *Applied Developmental Science*, *23*(4), 307–337.

- Catalano, R. F., Mazza, J. J., Harachi, T. W., Abbott, R. D., Haggerty, K. P., & Fleming, C. B. (2003). Raising healthy children through enhancing social development in elementary school: Results after 1.5 years. *Journal of School Psychology, 41*(2), 143–164.
- Catalano, R. F., Breglund, M. L., Ryan, J. A., Lonczak, H. S., & Hawkins, J. D. (2004). Positive youth development in the United States: Research findings on evaluations of positive youth development programs. *Annals of the American Academy of Political and Social Science, 591*(1), 98–124.
- Chen, C. M. (2004). Searching for intellectual turning points: Progressive knowledge domain visualization. *Proceedings of the National Academy of Sciences of the United States of America, 101*(1), 5303–5310.
- Chen, C. M. (2006). CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature. *Journal of the American Society for Information Science and Technology, 57*(3), 359–377.
- Chen, C. M., Song, I. Y., Yuan, X., & Zhang, J. (2008). The thematic and citation landscape of data and knowledge engineering (1985-2007). *Data & Knowledge Engineering, 67*, 234–259.
- Chen, C. M., Hu, Z., Liu, S., & Tseng, H. (2012). Emerging trends in regenerative medicine: A scientometric analysis in CiteSpace. *Expert Opinion on Biological Therapy, 12*(5), 593–608.
- Damon, W. (2004). What is positive youth development? *Annals of the American Academy of Political & Social Science, 591*(1), 13–24.
- Durlak, J. A., & Dupre, E. P. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American Journal of Community Psychology, 41*(3), 327–350.
- Eichas, K., Albrecht, R. E., Garcia, A. J., Ritchie, R. A., Varela, A., Garcia, A., & Kurtines, W. M. (2010). Mediators of positive youth development intervention change: Promoting change in positive and problem outcomes? *Child & Youth Care Forum, 39*(4), 211–237.
- Ekundayo, T. C., & Okoh, A. I. (2018). A global bibliometric analysis of plesiomonas-related research (1990-2017). *PLoS One, 13*(11), e0207655.
- Freud, A. (1969). Adolescence as a developmental disturbance. In G. Caplan & S. Lebovici (Eds.), *Adolescence* (pp. 5–10). New York: Basic Books.
- Fu, L. P., Sun, Z. H., He, L. P., Liu, F., & Jing, X. L. (2019). Global long-term care research: A scientometric review. *International Journal of Environmental Research and Public Health, 16*, 2077.
- Geldhof, G. J., Bowers, E. P., Boyd, M. J., Mueller, M. K., Napolitano, C. M., Schmid, K. L., Lerner, J. V., & Lerner, R. M. (2014). Creation of short and very short measures of the five Cs of positive youth development. *Journal of Research on Adolescence, 24*(1), 163–176.
- Guo, F., Li, F., Lv, W., & Liu, L. (2019). Bibliometric analysis of affective computing researches during 1999–2018. *International Journal of Human-Computer Interaction, 36*(4), 1–14.
- Hall, G. S. (1904). *Adolescence: Its psychology and its relations to physiology, anthropology, sociology, sex, crime, religion, and education*. New York: Appleton.
- Hamilton, S. F., Hamilton, M. A., & Pittman, K. J. (2004). Principles for youth development. In S. F. Hamilton & M. A. Hamilton (Eds.), *The youth development handbook: Coming of age in American communities*. Thousand Oaks: Sage Publications.
- Holt, N. L., Neely, K. C., Slater, L. G., Camiré, M., Côté, J., Fraser-Thomas, J., MacDonald, D., Strachan, L., & Tamminen, K. A. (2017). A grounded theory of positive youth development through sport based on results from a qualitative meta-study. *International Review of Sport & Exercise Psychology, 10*(1), 1–49.
- Jelicic, H., Bobek, D. L., Phelps, E., Lerner, R. M., & Lerner, J. V. (2007). Using positive youth development to predict contribution and risk behaviors in early adolescence: Findings from the first two waves of the 4-H study of positive youth development. *International Journal of Behavioral Development, 31*(3), 263–273.
- Jennifer, T., Jean, C., & David, J. H. (2014). Positive youth development from sport to life: Explicit or implicit transfer? *National Association for Physical Education in Higher Education, 66*(2), 203–217.
- Jiang, Y., Ritchie, B. W., & Benckendorff, P. (2019). Bibliometric visualisation: An application in tourism crisis and disaster management research. *Current Issues in Tourism, 22*(16), 1925–1957.
- Johnson, S. B., & Jones, V. C. (2011). Adolescent development and risk of injury: Using developmental science to improve interventions. *Injury Prevention, 17*(1), 50–54.
- Kann, L., McManus, T., Harris, W. A., et al. (2016). Youth risk behavior surveillance—United States, 2015. *MMWR Surveillance Summaries, 65*(SS-6), 1–174.
- Leipold, B., & Greve, W. (2009). Resilience: A conceptual bridge between coping and development. *European Psychologist, 14*(1), 40–50.
- Lerner, R. M. (2002). *Concepts and theories of human development* (3rd ed.). Mahwah: Lawrence Erlbaum.
- Lerner, R. M. (2004). *Liberty: Thriving and civic engagement among American youth*. Thousand Oaks: Sage.
- Lerner, R. M., Lerner, J. V., Almerigi, J. B., Theokas, C., Phelps, E., Gestsdottir, S., Naudeau, S., Jelicic, H., Alberts, A., Ma, L., Smith, L. M., Bobek, D. L., Richman-Raphael, D., Simpson, I., Christiansen, E. D.

- D., & von Eye, A. (2005). Positive youth development, participation in community youth development programs, and community contributions of fifth-grade adolescents: Findings from the first wave of the 4-H study of positive youth development. *The Journal of Early Adolescence*, 25(1), 17–71.
- Lerner, R. M. (2006). Developmental science, developmental systems, and contemporary theories of human development. In R. M. Lerner & W. Damon (Eds.), *Handbook of child psychology: Theoretical models of human development* (pp. 1–17). New Jersey: John Wiley & Sons Inc..
- Lerner, R. M., Von Eye, A., Lerner, J. V., Lewin, B., & S. (2009). Exploring the foundations and functions of adolescent thriving within the 4-H study of positive youth development: A view of the issues. *Journal of Applied Developmental Psychology*, 30(5), 567–570.
- Lerner, R. M., Agans, J. P., Desouza, L. M., & Gasca, S. (2013). Describing, explaining, and optimizing within-individual change across the life span: A relational developmental systems perspective. *Review of General Psychology*, 17(2), 179–183.
- Lerner, R. M., Tirrell, J. M., Dowling, E. M., Geldhof, G. J., Gestsdóttir, S., Lerner, J. V., King, P. E., Williams, K., Iraheta, G., & Sim, A. T. R. (2019). The End of the Beginning: Evidence and Absences Studying Positive Youth Development in a Global Context. *Adolescent Research Review*, 4, 1–14.
- Liu, W., Wang, J., Li, C., Chen, B., & Sun, Y. (2019). Using bibliometric analysis to understand the recent progress in agroecosystem services research. *Ecological Economics*, 156, 293–305.
- Ma, C. M. S., Shek, D. T. L., & Chen, J. M. T. (2019). Changed in the participants in a community-based positive youth development program in Hong Kong: Objective outcome evaluation using a one-group pretest-posttest design. *Quality of Life Research*, 14, 961–979.
- Maslow, G. R., & Chung, R. J. (2013). Systematic review of positive youth development programs for adolescents with chronic illness. *Pediatrics*, 131(5), 1605–1618.
- Masten, A. S. (2007). Resilience in developing systems: Progress and promise as the fourth wave rises. *Development and Psychopathology*, 19(3), 921–930.
- Mustafee, N., Katsaliaki, K., & Fishwick, P. (2014). Exploring the modelling and simulation knowledge base through journal co-citation analysis. *Scientometrics*, 98(3), 2145–2159.
- Niazi, M., & Hussain, A. (2011). Agent-based computing from multi-agent systems to agent-based models: A visual survey. *Scientometrics*, 89(2), 479–499.
- Nielsen, M., Haun, D., Kärtner, J., & Legare, C. H. (2017). The persistent sampling bias in developmental psychology: A call to action. *Journal of Experimental Child Psychology*, 162, 31–38.
- Noorden, R. V. (2015). Interdisciplinary research by the numbers. *Nature*, 525(7569), 306–307.
- Overton, W. F. (2013). A new paradigm for developmental science: Relationism and relational-developmental systems. *Applied Developmental Science*, 17(2), 94–107.
- Phelps, E., Zimmerman, S., Warren, A. E. A., Jeličić, H., von Eye, A., & Lerner, R. M. (2009). The structure and developmental course of positive youth development (PYD) in early adolescence: Implications for theory and practice. *Journal of Applied Developmental Psychology*, 30(5), 571–584.
- Santos, F., Camiré, M., & Campos, H. (2018). Youth sport coaches' role in facilitating positive youth development in Portuguese field hockey. *International Journal of Sport and Exercise Psychology*, 16, 221–234.
- Santos, F., Camiré, M., MacDonald, D. J., Campos, H., Conceição, M., & Silva, A. (2019). Process and outcome evaluation of a positive youth development-focused online coach education course. *International Sport Coaching Journal*, 6, 1–12.
- Sesma, A., Mannes, M., & Scales, P. C. (2005). *Positive adaptation, resilience, and the developmental asset framework*. New York: Springer US.
- Shek, D. T. L., Sin, A., & Lee, T. (2007). The Chinese positive youth development scale: A validation study. *Research on Social Work Practice*, 17, 380–371.
- Shek, D. T. L. (2007). A longitudinal study of perceived parental psychological control and psychological well-being in Chinese adolescents in Hong Kong. *Journal of Clinical Psychology*, 63(1), 1–22.
- Shek, D. T. L., Ma, H. K., & Merrick, J. (2010). *Positive youth development: Implementation of a youth program in a Chinese context*. New York Hauppauge: Nova Science Publishers.
- Shek, D. T. L., & Ma, C. (2010). Dimensionality of the Chinese positive youth development scale: Confirmatory factor analyses. *Social Indicators Research*, 98, 41–59.
- Shek, D. T. L. (2012). Spirituality as a positive youth development construct: A conceptual review. *Scientific World Journal*, 2012, 1–8.
- Shek, D. T. L., & Sun, R. C. (2013). The project p. a. t. h. s. in Hong Kong: Development, training, implementation, and evaluation. *Journal of Pediatric & Adolescent Gynecology*, 26(3), 2–9.
- Shek, D. T. L., Dou, D. Y., & Zhu, X. Q. (2019). Positive youth development: Current perspectives. *Adolescent Health Medicine and Therapeutics*, 10, 131–141.

- Shek, D. T. L. (2020). Perceptions of adolescents, teachers and parents of life skills education and life skills in high school students in Hong Kong. *Applied Research in Quality of Life*. <https://doi.org/10.1007/s11482-020-09848-9>.
- Shek, D. T. L., & Chai, W. Y. (in press). The impact of positive youth development attributes and life satisfaction on academic well-being: A longitudinal mediation study. *Frontiers in Psychology*.
- Shiffrin, R. M., & Borner, K. (2004). Mapping knowledge domains. *Proceedings of the National Academy of Sciences*, *101*(1), 5183–5185.
- Small, H. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents. *Journal of the American Society for Information Science*, *24*(4), 265–269.
- Song, J. B., Zhang, H. L., & Dong, W. L. (2016). A review of emerging trends in global PPP research: analysis and visualization. *Scientometrics*, *107*(3), 1111–1147.
- Sonnenwald, D. H. (2007). Scientific collaboration. *Annual Review of Information Science and Technology*, *41*(1), 643–681.
- Sun, J. F., Zhou, Z. C., Huang, J., & Li, G. X. (2020). A bibliometric analysis of the impacts of air pollution on children. *International Journal of Environmental Research and Public Health*, *17*(4), 1277.
- Sylvan, J. K., & Ben, R. M. (1997). What is research collaboration? *Research Policy*, *26*(1), 1–18.
- Taskin, Z., & Aydinoglu, A. U. (2015). Collaborative interdisciplinary astrobiology research: a bibliometric study of the NASA astrobiology institute. *Scientometrics*, *103*(3), 1003–1022.
- Tian, X., Geng, Y., Sarkis, J., & Zhong, S. (2018). Trends and features of embodied flows associated with international trade based on bibliometric analysis. *Resources Conservation & Recycling*, *131*, 148–157.
- Tolan, P., Ross, K., Arkin, N., Godine, N., & Clark, E. (2016). Toward an integrated approach to positive development: Implications for intervention. *Applied Developmental Science*, *20*(3), 214–236.
- UNICEF. (2005). *Childhood under threat: The state of the World's children*. New York: United Nations Children's Fund.
- UNICEF. (2017). *A familiar face: Violence in the lives of children and adolescents*. New York: United Nations Children's Fund.
- Van, L. T. (2006). The application of bibliometric analyses in the evaluation of social science research. Who benefits from it, and why it is still feasible. *Scientometrics*, *66*(1), 133–154.
- Waid, J., & Uhrich, M. (2019). A scoping review of the theory and practice of positive youth development. *British Journal of Social Work*, *0*, 1–20.
- Waid, J., & Uhrich, M. (2020). A scoping review of the theory and practice of positive youth development. *British Journal of Social Work*, *50*(1), 5–24.
- Wang, M. X., Liu, P., Gu, Z. L., et al. (2019). A scientometric review of resource recycling industry. *International Journal of Environmental Research and Public Health*, *16*(23), 46–54.
- Wang, Z. H., Zhao, Y. D., & Wang, B. (2018). A bibliometric analysis of climate change adaptation based on massive research literature data. *Journal of Cleaner Production*, *199*, 1072–1082.
- Wiium, N., & Dimitrova, R. (2019). Positive youth development across cultures: Introduction to the special issues. *Child & Youth Care Forum*, *48*, 147–153.
- World Bank. (2000). *World development report 2000–2001: Attacking poverty*. Washington DC: World Bank Group.
- World Bank. (2007). *World development report 2007: Development and the next generation*. Washington DC: World Bank Group.
- Xu, M., Williams, P. J., & Gu, J. J. (2020). Hotspots and trends of technology education in the international journal of technology and design education: 2000–2018. *International Journal of Technology and Design Education*, *30*(2), 207–224.
- Yu, D. J. (2015). A scientometrics review on aggregation operator research. *Scientometrics*, *105*(1), 115–133.
- Zhou, W., Kou, A. Q., Chen, J., & Ding, B. Q. (2018). A retrospective analysis with bibliometric of energy security in 2000–2017. *Energy Report*, *4*, 724–732.
- Zhou, Z., Shek, D. T. L., Zhu, X., & Dou, D. (2020a). Positive youth development and adolescent depression: A longitudinal study based on mainland Chinese high school students. *International Journal of Environment Research and Public Health*, *17*, 44–57.
- Zhou, Z., Shek, D. T. L., Zhu, X. (2020b). The importance of positive youth development attributes to life satisfaction and hopelessness in mainland Chinese adolescents. *Frontiers in Psychology*, *11*, article 553313.
- Zhu, X., & Shek, D. T. L. (2020). Impact of a positive youth development program on junior high school students in mainland China: A pioneer study. *Children and Youth Services Review*, *114*, article 105022.