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REVIEW

Thyroid Cancer and Physical Activity: A Bibliometric Analysis

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Background: Numerous studies focusing on physical activity in the context of thyroid cancer have been reported in recent years. However, there is no bibliometric analysis in this research field. This study aims to provide a comprehensive overview of the knowledge structure and research hotspots of physical activity in thyroid cancer through bibliometrics.

Methods: Publications related to physical activity in thyroid cancer were searched in the Web of Science Core Collection (WoSCC) and PubMed databases from January 1, 2001 to May 31, 2025. VOSviewers, CiteSpace and R package "bibliometrix" were used to conduct bibliometric analysis.

Results: This bibliometric analysis spanned from 2001 to 2025 and involved 1020 authors from 182 institutions across 46 countries who contributed to 173 papers in 111 academic journals on physical activity in thyroid cancer. There has been an exponential growth trend in research on thyroid cancer and physical activity since 2009, with the United States leading in terms of publication volume. The United States dominated both in publications and citations. The journal *Thyroid* led in both the number of publications and the frequency of citations. Studies predominantly focused on foundational clinical topics, with recent trends shifting towards metabolic health and patient-centered outcomes, reflecting global priorities in cancer survivorship care.

Conclusion: This bibliometric study charts the evolution of thyroid cancer and physical activity research toward metabolic health and patient-centered outcomes. The assembled body of evidence conclusively links physical activity to a lower disease risk and better clinical outcomes, highlighting its significant public health and clinical implications.

Keywords: thyroid cancer, physical activity, quality of life, bibliometric analysis

Introduction

Thyroid cancer (TC), the most common malignancy of the endocrine system, has recently shown a significant rise in incidence worldwide. Globally, the age-standardized incidence and mortality rates for thyroid cancer in 2022 were 9.10 and 0.44 per 100,000 population, respectively. Clear age trends were discerned, with the majority of new cases (64.63%) occurring in individuals under 55 years, while most deaths (82.99%) were concentrated in those aged 55 and above. Assuming that 2022 incidence and mortality rates remain constant, projections indicate approximately 1.1 million new TC cases and 91,000 TC-related deaths globally by 2050.[1] In China, the age-standardized mortality rates of thyroid cancer in 2019 was 0.51 per 100,000 population, representing an increase of 118.1%.[2] Moreover, thyroid cancer represents a growing public health challenge worldwide, highlighting the urgent need for targeted strategies to enhance prevention, early diagnosis, and effective treatment.[3,4]

The rising incidence of thyroid cancer involves complex and not yet fully elucidated factors. The increased risk of thyroid cancer from radiation exposure, particularly in children, was clearly demonstrated after Chernobyl, in contrast to the minimal releases of Three Mile Island and Fukushima, highlighting the critical role of radioactive iodine dose to the thyroid.[5] Studies suggest that both insufficient and excessive iodine intake may be associated with an elevated risk of thyroid carcinogenesis.[6,7]

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Furthermore, imbalances in essential trace elements (eg, Fe, Cu, Zn, Se, I) and exposure to toxic metals (eg, Cd, Pb, As) within thyroid cells may contribute to the pathogenesis of thyroid diseases, including thyroid cancer.[8–10] A number of environmental chemical contaminants, such as bisphenol A (BPA), polychlorinated biphenyls (PCBs), and polybrominated diphenyl ethers (PBDEs), have been implicated in the etiology of goiter and nodular goiter, demonstrating carcinogenic potential for papillary thyroid cancer.[7] Research has established that somatic mutation burden, TERT promoter mutations, RAS mutations, and the clonal architecture of BRAF mutations serve as key determinants for risk stratification in thyroid cancer.[11,12] Recent studies have explored the potential link between metabolic syndrome—particularly its components such as obesity—and the increased incidence and aggressiveness of thyroid cancer.[13,14]

Epidemiological studies have shown that physical activity (PA) is beneficial for cancer prevention, improved survival, and quality of life (QoL).[15,16] Studies suggest that increased engagement in low-intensity physical activity may represent a feasible population-based strategy for cancer risk reduction, particularly among aging populations.[17,18] Increased physical activity confers significant survival advantages for middle-aged and older populations, including cancer survivors.[19] Therefore, adults should perform 150–300 minutes of moderate-intensity or 75–150 minutes of vigorous-intensity aerobic activity weekly (or equivalent combination), as well as muscle-strengthening exercise on ≥2 days/week according to the Physical Activity Guidelines for Americans.[20] Several clinical studies have demonstrated that physical activity confers health benefits in thyroid cancer patients.[21–23] In the study by Kim, patients in the home-based exercise group showed significant reductions in both fatigue and anxiety ($p < 0.01$), along with a significant improvement in QoL ($p < 0.05$), compared to the control group.[23] Additionally, some studies have shown that thyroid cancer incidence has a strong inverse correlation with physical activity levels.[24,25] A prospective cohort study in South Korea revealed that participants with the highest physical activity level had a lower risk of thyroid cancer (HR = 0.65; 95% CI, 0.44–0.94; $p = 0.028$) than those with the lowest level.[24]

A bibliometric analysis systematically maps the scholarly attention and developmental trajectories within a specific research domain by quantifying temporal trends in publication outputs, identifying leading contributors and determining high-impact works through citation metrics. To the best of our knowledge, bibliometric studies focusing on the association between physical activity and thyroid cancer are currently lacking in the published literature. The research on physical activity in patients with and survivors of thyroid cancer is both intricate and continually evolving. Thus, it is necessary to conduct a broad meta-analysis on the association between physical activity and the pathogenesis, progression, and prognosis of thyroid cancer. This study employs bibliometric analysis to systematically examine temporal publication trends, productivity metrics of journals/authors, and thematic clusters within existing literature on physical activity and thyroid cancer, thereby identifying knowledge domains and citation-impact patterns.

Materials and Methods

Data Collection

This bibliometric review was conducted in accordance with the BIBLIO Checklist (see Supplementary File 1). The Web of Science Core Collection (WoSCC) database of Clarivate Analytics and PubMed database were used as data sources. Data were extracted from WoSCC and PubMed on May 31, 2025. The search strategy was designed as follows: TS= ("Thyroid Neoplasm" or "Thyroid Tumor" or "Thyroid Tumour" or "Thyroid Cancer" or "Thyroid Carcinoma" or "Cancer of Thyroid" or "Carcinoma of Thyroid") AND TS=("physical activity" OR exercise). To minimize potential bias in our analysis, the following refining criteria were applied: (1) timespan: January 1, 2001 to May 31, 2025; (2) document types were restricted to the article and review; and (3) written in English. As a result, a total of 173 publications were obtained for advanced analysis. Two reviewers (BD and SX) independently conducted data extraction from included studies, with cross-verification by a third reviewer (WZ) to ensure accuracy. The flowchart of article inclusion is shown in Figure 1.

Data Analysis

Data management and bibliometric analysis of annual publications were conducted using Microsoft Office Excel 2023 (Microsoft, Redmond, WA, USA). The "bibliometrix" package of R (v4.5.0) is an open-source tool for performing comprehensive science mapping analysis.[26] Moreover, bibliometric analysis was conducted using CiteSpace (version 6.4.R2) and

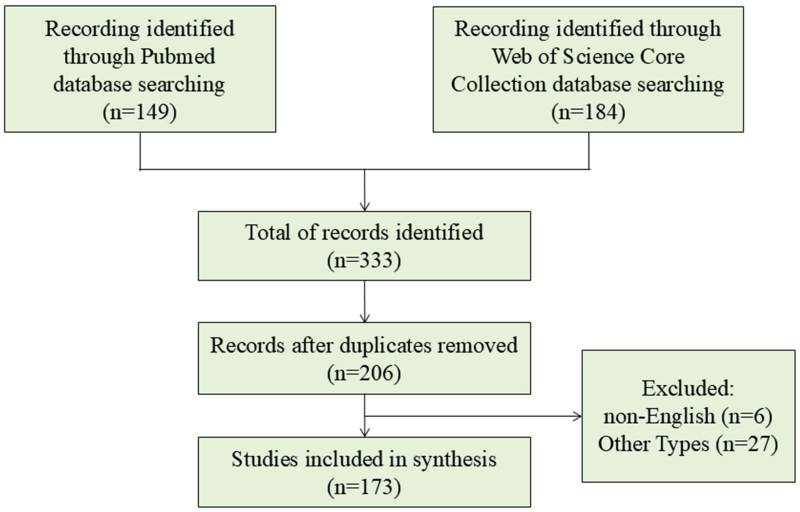

Figure 1 Flowchart of bibliometric analysis.

VOSviewer (version 1.6.20) to construct visualization frameworks for collaborative networks among authors, co-citation patterns of journals, geographical and institutional distributions of contributing entities, keyword co-occurrence clusters, and reference co-citation networks. CiteSpace is a Java-based bibliometric analysis tool that transforms raw bibliographic data into visualized literature networks through statistical modeling and network mapping.[27] CiteSpace and VOSviewer were integrated for multidimensional bibliometric analysis.

Results

Exponential Growth in Annual Publications and Citations

A total of 173 articles were included in this study. Figure 2 shows that the highest number of publications (n=18) occurred in 2024, while very few publications were recorded several years in the early 21st century. As of May 31, 2025, the total citation counts reached 5356, yielding an average of 30.96 citations per article. Figure 2 visually demonstrates

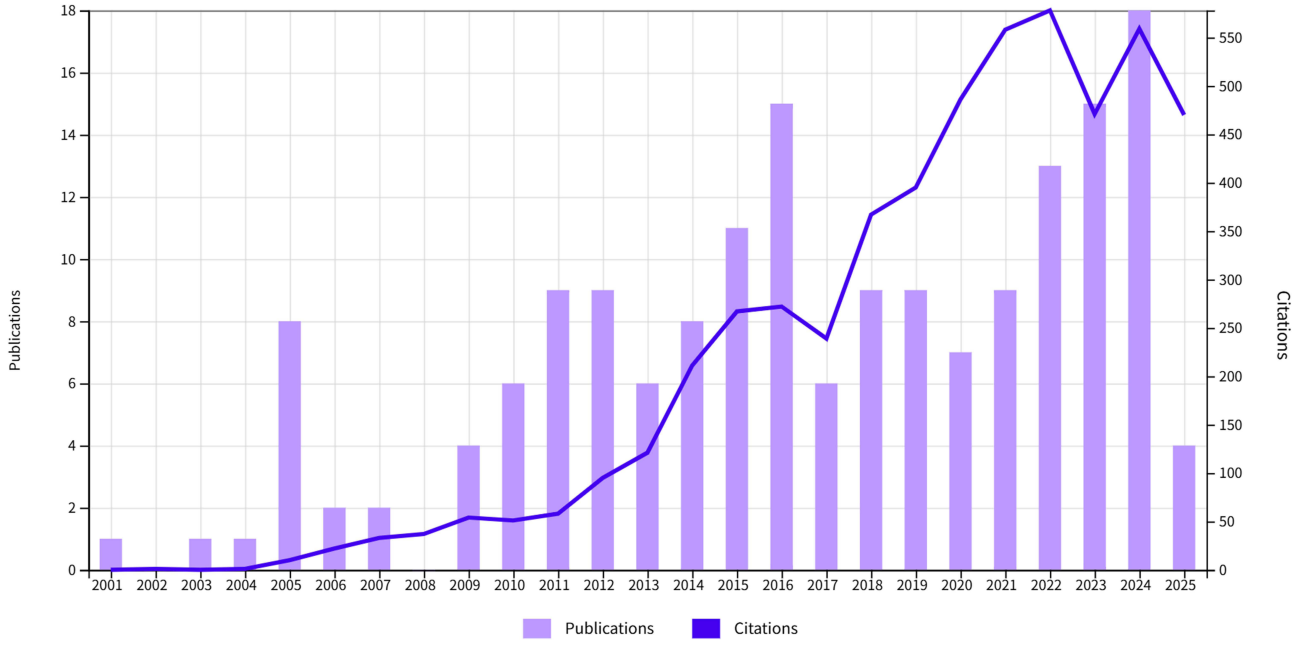

Figure 2 Annual publication outputs and citations of research on thyroid cancer and physical activity.

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a consistent upward trajectory in both publications and citations since 2009, reflecting growing scholarly interest in the field and underscoring its research potential.

Countries and Institutions

These publications came from 46 countries and 182 institutions. The country with the largest number of publications is the United States (n=53, 30.6%), followed by China (n=32, 18.5%), South Korea (n=28, 16.2%), Italy (n=21, 12.1%), and Germany (n=14, 8.1%) (Table 1). Subsequently, 17 countries with at least 5 publications were selected and visualized, while a collaborative network was constructed based on publication volumes and collaboration patterns (Figure 3). The network exhibits dense collaborative connections among countries.

The top 10 institutions are located in 6 countries, and the majority of them are located in South Korea and the United States. The top three institutions with the highest number of publications are: Seoul National University (n=10, 5.8%), National Cancer Institute (n=9, 5.2%) and National Cancer Center Korea (n=8, 4.6%) (Table 1). Subsequently, 65 institutions were selected based on the minimum number of publications equal to 2 for visualization, and a collaborative network was constructed based on the number and relationship of publications from each institution (Figure 4). As shown in Figure 4, there is an active cooperation between different institutions.

Journals and Co-Cited Journals

Publications related to physical activity in thyroid cancer were published in 111 journals. Most papers were published in *Thyroid* (n=16, 9.2%), followed by *Cancer Causes & Control* (n=6, 3.5%), *Scientific Reports* (n=5, 2.9%), and *International Journal of Cancer* (n=5, 2.9%). Among the top 10 journals, the journal with the highest impact factor is *Thyroid* (IF=6, Q1), followed by *International Journal of Cancer* (IF=5.7, Q1) and *European Journal of Endocrinology* (IF=5.3, Q1) (Table 2). Subsequently, 28 journals were screened based on the minimum number of relevant publications equal to 2 and the journal network was mapped (Figure 5A). Figure 5A shows that *Thyroid* has active citation relationships with other journals such as *Cancer Causes & Control* and *International Journals of Cancer*.

The top 10 co-cited journals were listed in Table 2. *Thyroid* (co-citation=377) was the most cited journal, followed by *Journal of Clinical Endocrinology & Metabolism* (co-citation=372) and *Cancer Causes & Control* (co-citation=308). Notably, the highest impact factor of co-cited journal was *The New England Journal of Medicine* (IF=96.3). A total of 70 Journals with the minimum co-citation equal to 20 were filtered to map the co-citation network (Figure 5B).

The dual-map overlay visualization delineates the intellectual structure of scholarly communication by mapping citation linkages between journals, wherein the left hemisphere represents clusters of citing journals and the right hemisphere depicts clusters of co-cited journals, elucidating the knowledge transfer pathways across disciplinary boundaries.[28] As illustrated in Figure 6, the green path constitutes the primary citation trajectory, indicating that research published in Medicine/Medical/Clinical journals is primarily cited by studies in Health/Nursing/Medicine and Molecular/Biology/Genetics journals.

Table 1 Top10 Countries and Institutions of Research on Thyroid Cancer and Physical Activity

Rank	Country	Counts	Institution	Counts
1	The United States (North America)	53(30.6%)	Seoul National University (South Korea)	10(5.8%)
2	China (Asia)	32(18.5%)	National Cancer Institute (The United States)	9(5.2%)
3	South Korea (Asia)	28(16.2%)	National Cancer Center Korea (South Korea)	8(4.6%)
4	Italy (Europe)	21(12.1%)	University of Toronto(Canada)	4(2.3%)
5	Germany (Europe)	14(8.1%)	Hallym University (South Korea)	4(2.3%)
6	United Kingdom (Europe)	10(5.8%)	Universidade Federal do Rio de Janeiro(Brazil)	4(2.3%)
7	Netherlands (Europe)	9(5.2%)	Catholic University of Korea (South Korea)	4(2.3%)
8	Spain (Europe)	9(5.2%)	University of Naples Federico II (Italy)	4(2.3%)
9	France (Europe)	8(4.6%)	University of Regensburg(Germany)	4(2.3%)
10	Canada (North America)	7(4.0%)	The University of Texas MD Anderson Cancer Center (The United States)	3(1.7%)

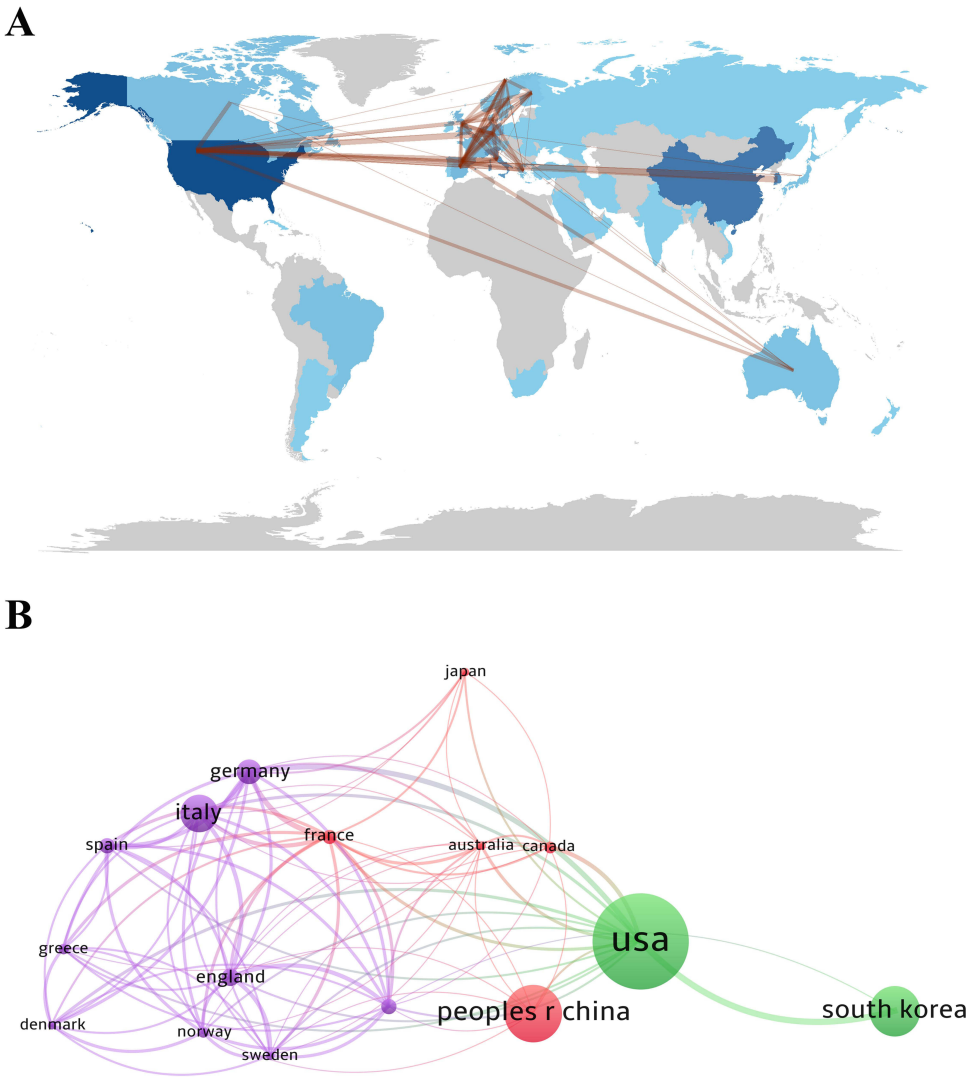

Figure 3 The geographical distribution (**A**) and visualization of countries (**B**) of research on thyroid cancer and physical activity.

Authors and Co-Cited Authors

A total of 1020 authors participated in the research of physical activity in thyroid cancer. Among the top 10 authors, Kitahara CM, Berrington de Gonzalez A, Vaisman M, Teixeira PFS, and de Oliveira Chachamovitz DS are the top five authors, each having published the same maximum number (up to 4) of papers (Table 3). A collaborative network was constructed based on 61 authors whose number of published papers is more than or equal to 2 (Figure 7A). Kitahara CM, Berrington de Gonzalez A, Vaisman M, Teixeira PFS, and de Oliveira Chachamovitz DS have the largest academic impact nodes as they have published the most related publications (Figure 7B).

Co-Cited References

There are 7473 co-cited references on the research of physical activity in thyroid cancer. In the top 10 co-cited references (Table 4),[29–38] 7 references were co-cited at least 20 times. The references with co-citation more than or equal to 10 were selected for the construction of the co-citation network map (Figure 8).[29–31,33,34,39–48]

Reference with Citation Bursts

References exhibiting citation bursts denote seminal publications that experience a sudden surge in citation frequency within a specific academic discipline during a defined time period. The strength value is a metric generated by

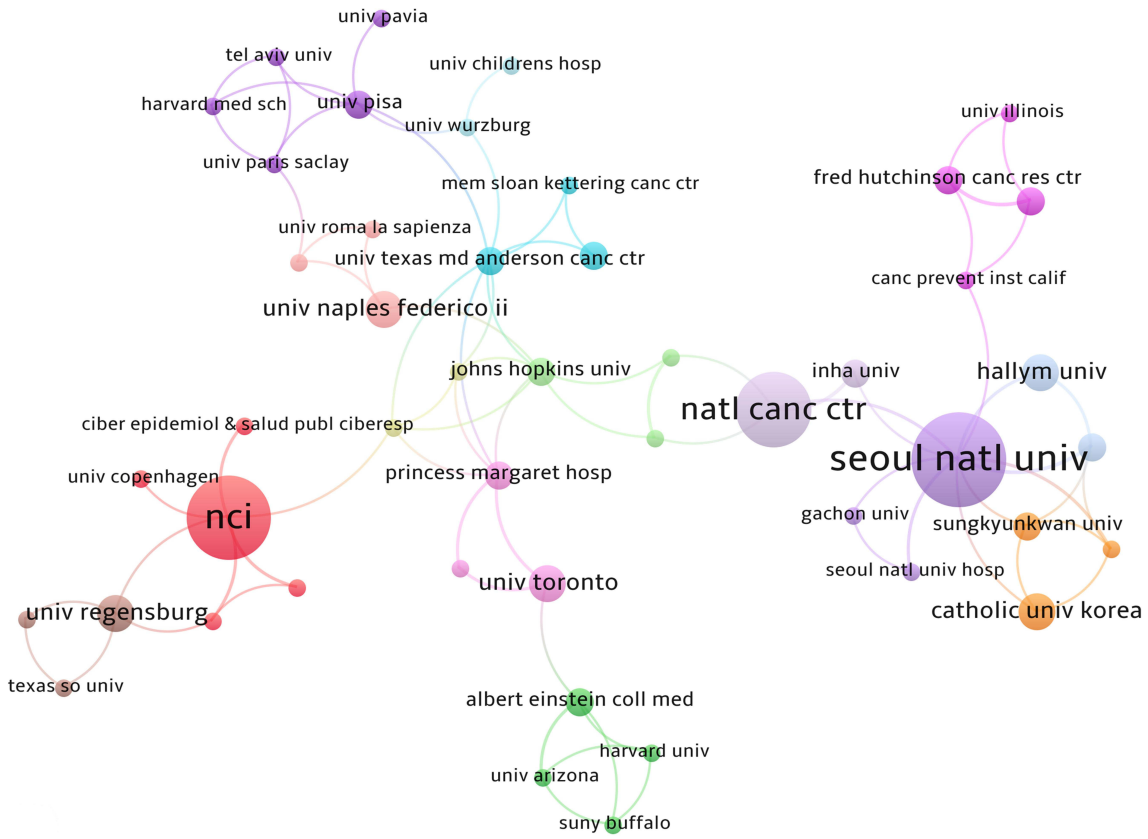

Figure 4 The visualization of institutions of research on thyroid cancer and physical activity.

CiteSpace's burst detection algorithm. It quantifies the intensity of a sudden surge in citations for a given reference. A higher strength value indicates a more pronounced increase in academic attention during the specified burst period.[49] In this study, 10 references with strong citation bursts were identified by CiteSpace (Figure 9).[29,31,33,34,36,37,46,50–52] The beginning of a blue line depicts when an article is published. The beginning of a red segment marks the beginning of a period of burst, whereas the end of the red segment marks the end of the burst period. Citation bursts for references appeared as early as 2010 and as late as 2025. The reference with the strongest citation burst (strength=5.01) was titled "anthropometric factors and physical activity and risk of thyroid cancer in postmenopausal women", authored by Kabat et al with citation bursts from 2013 to 2016.[36] Table 5 summarizes the main research contents of the 10 references in the order of the literature in Figure 9.

Table 2 Top 10 Journals and Co-Cited Journals of Research on Thyroid Cancer and Physical Activity

Rank	Journal	Counts	IF	Q	Co-Cited Journal	Co-Citations	IF	Q
1	Thyroid	16	6	1	Thyroid	377	6	1
2	Cancer Causes & Control	6	2.2	3	Journal of Clinical Endocrinology & Metabolism	372	5	1
3	International Journal of Cancer	5	5.7	1	Cancer Causes & Control	308	2.2	2
4	Scientific Reports	5	3.8	1	International Journal of Cancer	233	5	1
5	European Journal of Endocrinology	4	5.3	1	Cancer Epidemiology Biomarkers & Prevention	142	3.7	2
6	Frontiers in Endocrinology	4	3.9	2	American Journal of Epidemiology	140	5	1
7	Journal of Clinical Endocrinology & Metabolism	3	5	1	British Journal Of Cancer	132	6.4	1
8	BMC Public Health	3	3.5	1	Journal of Clinical Oncology	117	42.1	1
9	Cancer Epidemiology Biomarkers & Prevention	3	3.7	2	The New England Journal of Medicine	104	96.3	1
10	European Thyroid Journal	3	3.5	2	Clinical Endocrinology	97	3	2

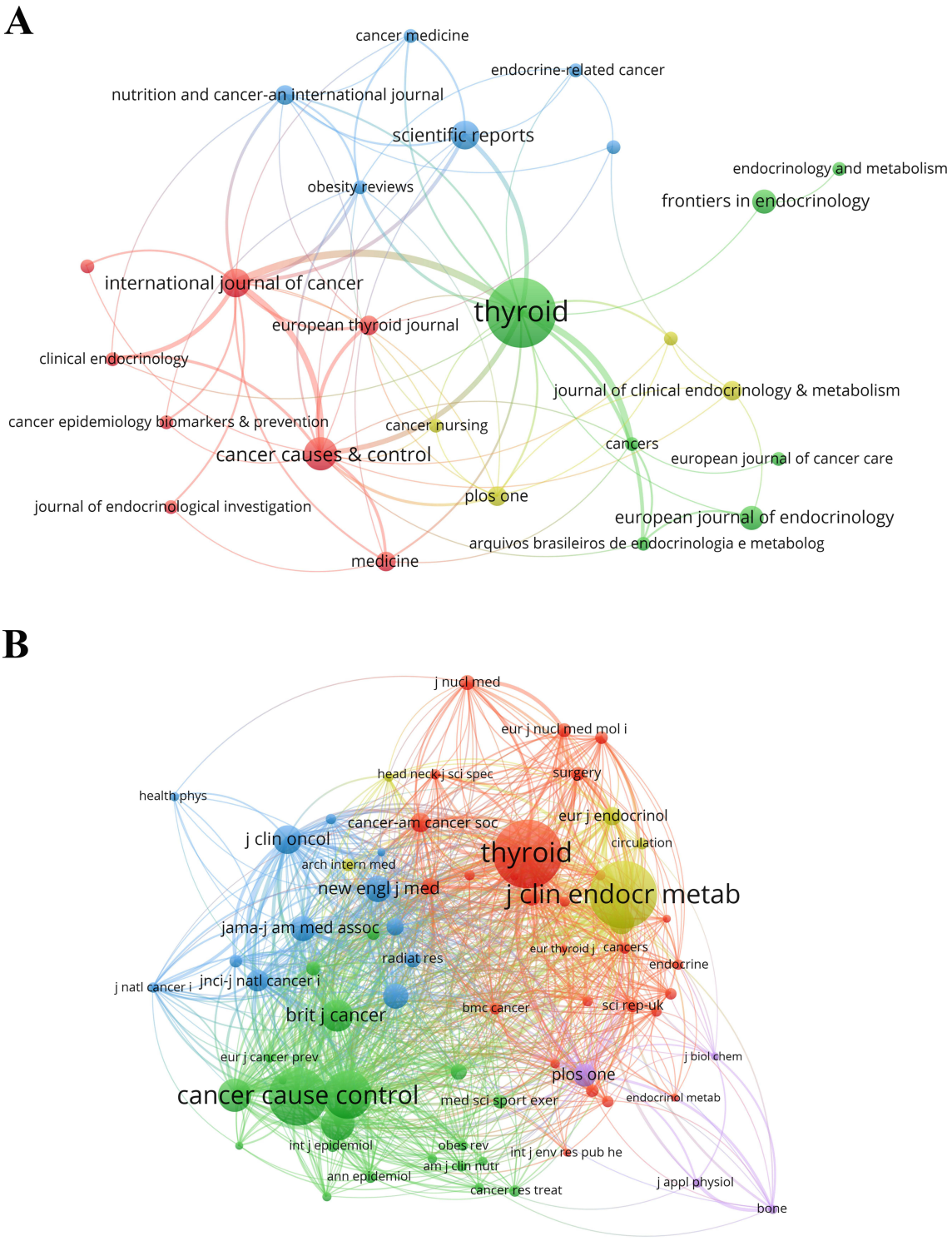

Figure 5 The visualization of journals (**A**) and co-cited journals (**B**) of research on thyroid cancer and physical activity.

Hotspots and Frontiers

By analyzing the co-occurrence of keywords, research hotspots were efficiently identified within a given field. Keywords with the number of occurrences more than or equal to 3 were filtered to perform cluster analysis through VOSviewer (Figure 10A). Among these keywords, "obesity", "body mass index" and "quality of life" appeared most frequently, indicating a key research focus on physical activity in thyroid cancer. The trend analysis of keywords (Figure 10B)

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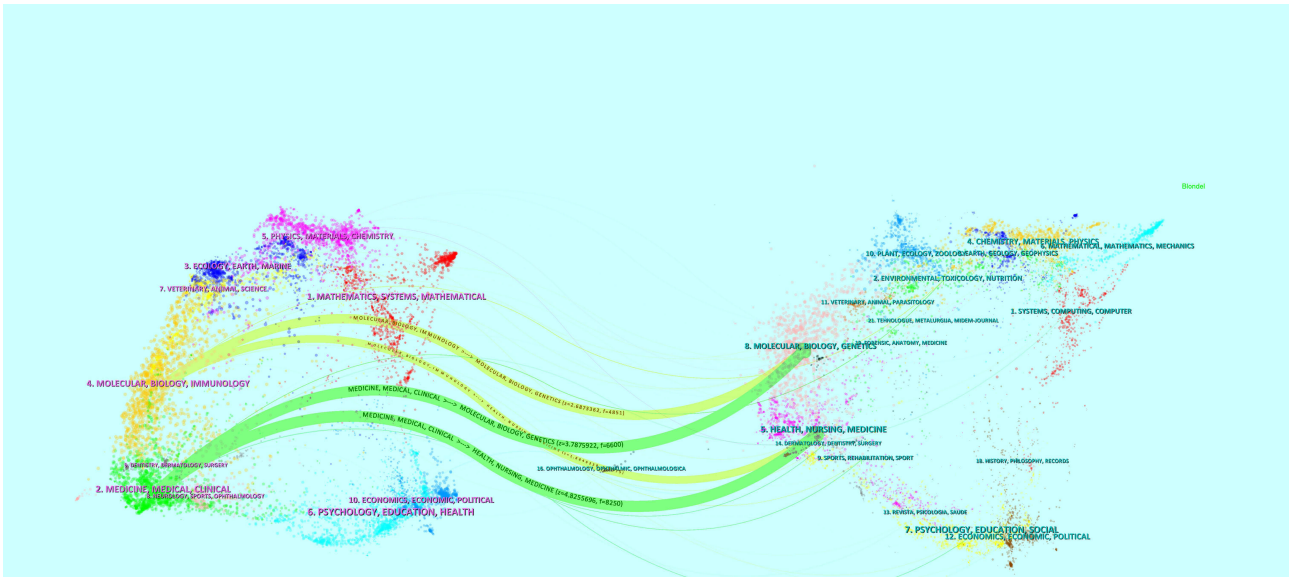

Figure 6 The dual-map overlay of journals of research on thyroid cancer and physical activity.

revealed two distinct research phases: from 2010 to 2016, studies predominantly focused on foundational clinical topics such as "hypothyroidism" and "thyroid neoplasms"; and from 2018 to 2022, research emphasis was shifted significantly toward metabolic health ("obesity", "exercise") and patient-centered outcomes ("quality of life"), reflecting global priorities in cancer survivorship care.

Discussion

Thyroid cancer is recognized as one of the most treatable malignancies, with 5-year survival rates exceeding 95%.[53] In 2022, thyroid cancer ranked as the seventh most common cancer globally, with over 821,000 incident cases worldwide. Despite its high incidence, the disease's mortality was much lower, accounting for an estimated 44,000 deaths (ranking 24th).[54] The role of radiation as a key environmental risk factor for thyroid carcinogenesis provides a critical context for interpreting modifiable lifestyle factors such as physical activity. While radiation exposure, particularly in childhood, is linked to specific oncogenic drivers such as RET/PTC rearrangement, the potential protective association of physical activity may operate through distinct mechanisms. Given the rising global incidence of thyroid cancer and its associated quality of life impairment, investigating the therapeutic potential of physical activity has become clinically imperative. Recent years have witnessed a significant increase in research exploring the relationship between thyroid cancer and

Table 3 Top 10 Authors and Co-Cited Authors of Research on Thyroid Cancer and Physical Activity

Rank	Authors	Counts	Co-Cited Authors	Citations
1	Kitahara CM	4	Kitahara CM	90
2	Berrington de Gonzalez A	4	Biondi B	68
3	Vaisman M	4	Kabat GC	32
4	Teixeira PFS	4	Dal Maso L	32
5	De Oliveira Chachamovitz DS	4	Haugen BR	30
6	Park Y	3	Meinhold CL	29
7	Rohan TE	3	Leitzmann MF	29
8	Vigario PDS	3	Renehan AG	28
9	Han K	3	Ron E	26
10	Kim J	3	Samanic C	25

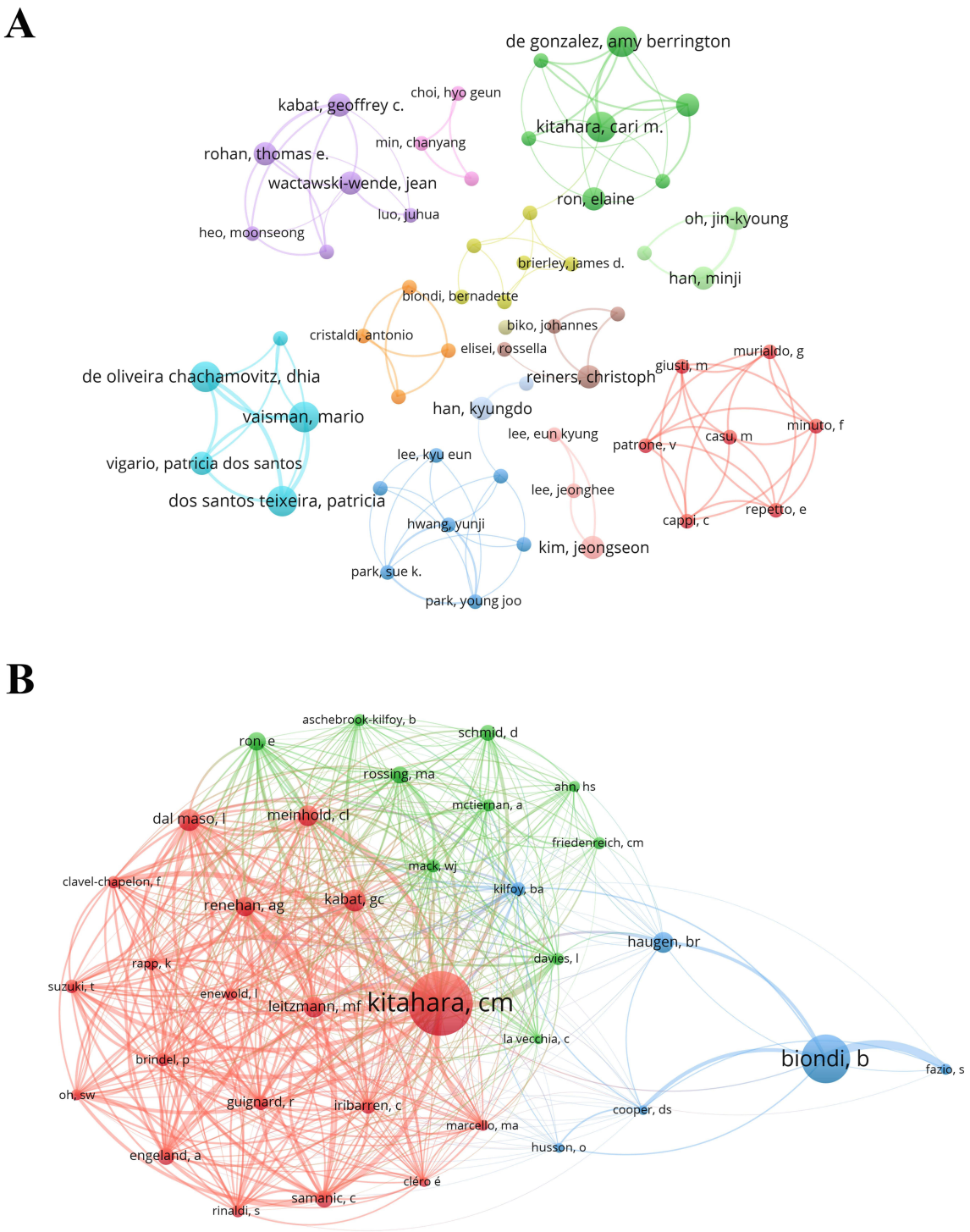

Figure 7 The visualization of authors (**A**) and co-cited Authors (**B**) of research on thyroid cancer and physical activity.

physical activity. Most studies have focused on the impact of physical activity on both the etiology and quality of life outcomes in thyroid cancer.[25,29,36,52] However, the specific research contents and future directions regarding the relationship between thyroid cancer and physical activity remain to be clarified.

The properties of 173 documents were analyzed through bibliometry, more specifically, 143 individual studies and 30 review articles on thyroid cancer and PA published from 2001 to 2025 in WoSCC and PubMed.

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Table 4 Top 10 Co-Cited References of Research on Thyroid Cancer and Physical Activity

Rank	Co-Cited reference	Citations
1	Leitzmann MF, 2010, Int J Cancer, V126, P2947[29]	26
2	Haugen BR, 2016, Thyroid, V26, P1[30]	26
3	Meinhold CL, 2010, Am J Epidemiol, V171, P242[31]	25
4	Engeland A, 2006, Brit J Cancer, V95, P366[32]	24
5	Guignard R, 2007, Am J Epidemiol, V166, P1140[33]	21
6	Kitahara CM, 2011, Cancer Epidem Biomar, V20, P464[34]	21
7	Iribarren C, 2001, Int J Cancer, V93, P745[35]	21
8	Kabat GC, 2012, Cancer Cause Control, V23, P421[36]	19
9	Clavel-Chapelon F, 2010, Int J Cancer, V126, P2984[37]	18
10	Suzuki T, 2008, Cancer Cause Control, V19, P1233[38]	18

There have been 1020 co-authors from 46 countries who published on this topic, and during this period, the most prolific countries are the United States, China, and South Korea. This may correlate with geographical variations in thyroid cancer incidence rates, as the highest incidence rate is found in Eastern Asia, where the rate is twice as high as that in the second-ranking Northern America, according to global cancer statistics.[54] However, exponential growth in the number of publications had not occurred until 2009, and even no publications were recorded in some years at all. Furthermore, the annual publication numbers fluctuated and declined during the period of 2017–2020. This trend can be primarily attributed to the disruptive impact of the COVID-19 pandemic, which, especially in 2020, led to widespread laboratory closures, a significant reallocation of scientific resources and editorial focus toward pandemic-related research, and substantial delays in the peer-review process for non-COVID manuscripts. Additionally, this period may reflect a natural maturation of the research field, moving the past initial rapid growth into a phase of consolidation, potentially awaiting new conceptual or technological breakthroughs to stimulate the next wave of publications.

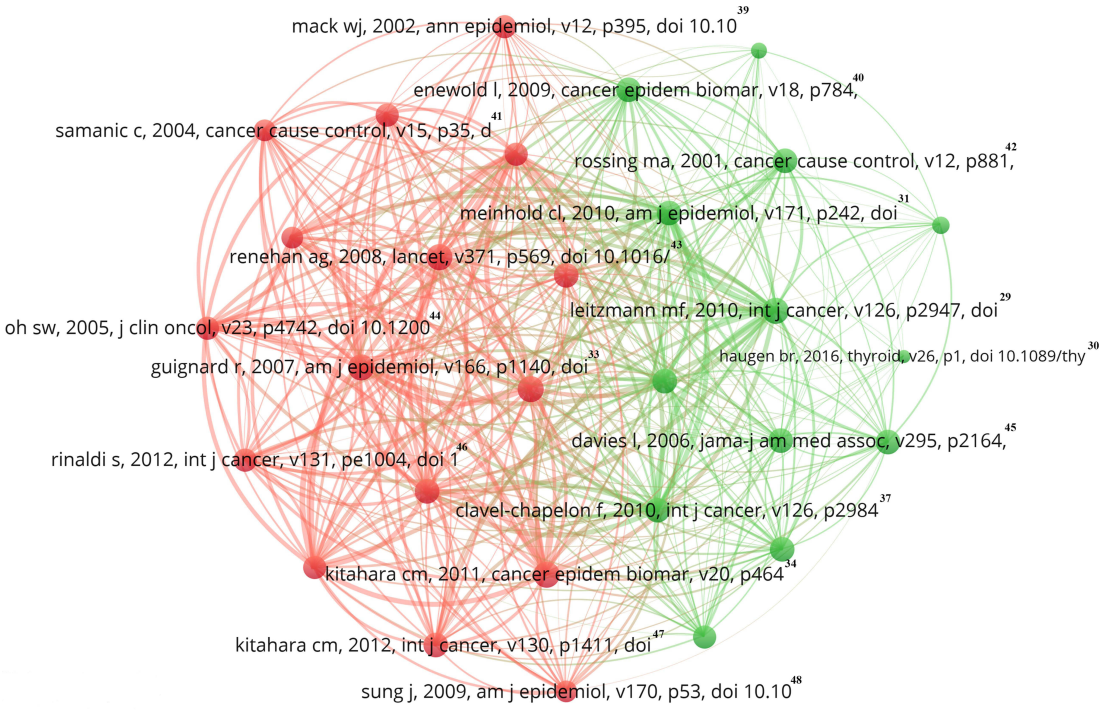

Figure 8 The visualization of co-cited references of research on thyroid cancer and physical activity.

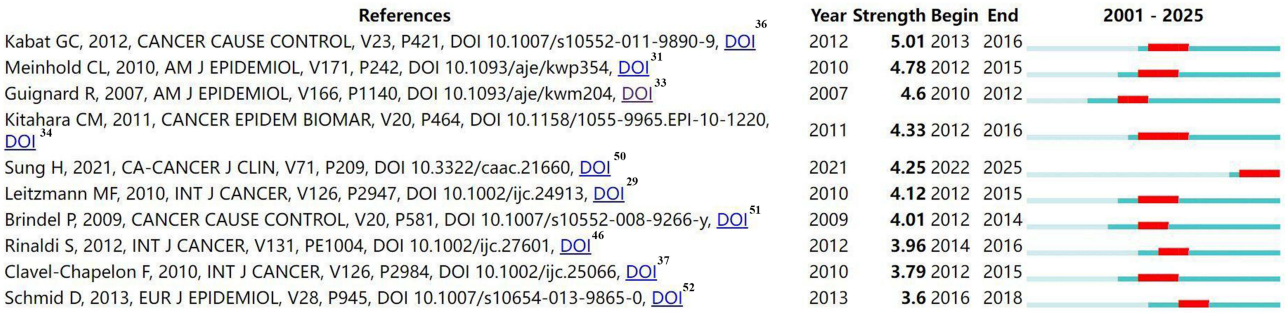

Figure 9 Top 10 references with strong citation bursts. A red bar indicates high citations in that year.

Thyroid is a leading peer-reviewed journal and the official publication of the American Thyroid Association (ATA), which publishes high-impact research and clinical advances in thyroidology, from molecular mechanisms to patient care. *Journal of Clinical Endocrinology & Metabolism* focuses on clinical and translational research in endocrinology, covering hormone-related disorders, metabolism, diabetes, and endocrine oncology. *Cancer Causes & Control* specializes in epidemiological and population-based research on cancer risk factors, prevention, and global disease patterns. Thus, the majority of studies on physical activity in thyroid cancer are published in or cited by journals specializing in thyroid research, cancer etiology, or cancer prevention.

The reference by Kabat et al (2012), titled "Anthropometric factors and physical activity and risk of thyroid cancer in postmenopausal women", exhibited the strongest citation burst, with a strength of 5.01. This prospective cohort study of 144,319 postmenopausal women found that greater attained height was significantly associated with an increased risk of overall and papillary thyroid cancer. In contrast, most adults' anthropometric measures and physical activity showed no association, suggesting the influence of early-life genetic or environmental factors on thyroid cancer risk.[36] Conversely, other studies showed that thyroid cancer was strongly positively associated with weight and body mass index, and there was a clear dose-response trend.[13,29,32] It is well-established that physical activity is a key behavioral lever that influences body weight and body mass index through energy expenditure and body composition modulation, leading to an inverse association between activity levels and these anthropometric measures.[55,56] Body mass index and physical activity are considered as subjects of interest for investigators in thyroid cancer research, reflecting growing recognition of their role in patient well-being and recovery, alongside numerous publications on other TC-related topics.[29,57]

Based on the analysis of keyword co-occurrence and review of the timelines of research topic publication, research hotspots and trends were identified in the field of thyroid cancer and physical activity. There has been a growing research emphasis on obesity, exercise, and quality of life in the past 5–10 years. Overweight and obesity are well-established risk factors for multiple cancer types.[58]

Table 5 The Main Research Contents of the 10 References with Strong Citations Bursts

Rank	Strength	Main Research Contents
1	5.01	Anthropometric factors and physical activity and risk of thyroid cancer
2	4.78	Nonradiation risk factors for thyroid cancer
3	4.6	Drinking, smoking, and anthropometric characteristics as risk factors for thyroid cancer
4	4.33	Obesity and thyroid cancer risk
5	4.25	Incidence and mortality worldwide for 36 cancers
6	4.12	Body mass index, physical activity and thyroid cancer risk
7	4.01	Anthropometric factors in differentiated thyroid cancer
8	3.96	Body size and risk of differentiated thyroid carcinomas
9	3.79	Risk of differentiated thyroid cancer in relation to adult weight, height and body shape
10	3.6	Physical activity, diabetes, and risk of thyroid cancer

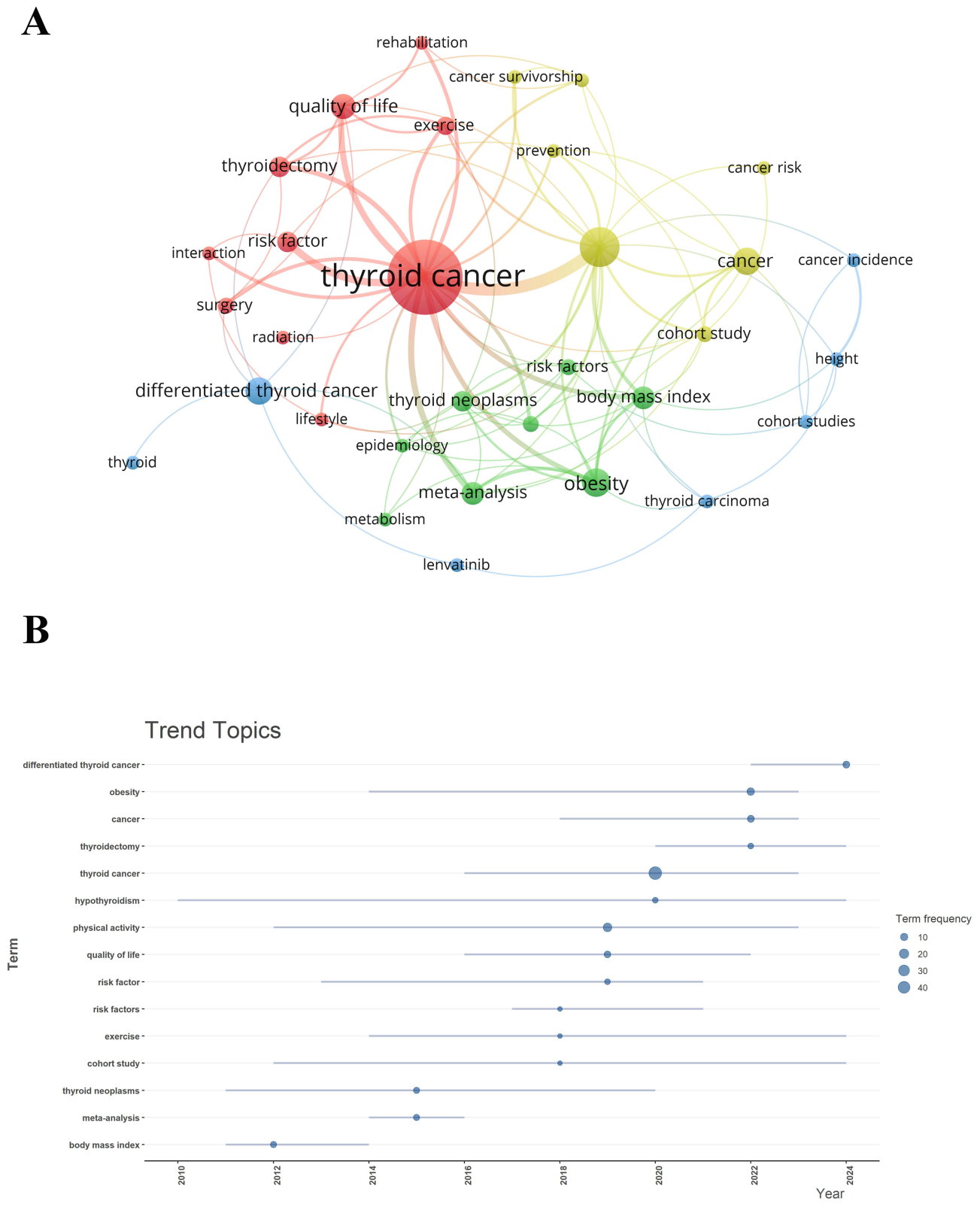

Figure 10 Keyword cluster analysis (**A**) and trend topic analysis (**B**) of research on thyroid cancer and physical activity.

Similarly, studies have established obesity as a well-documented risk factor for thyroid cancer.[34,59] Consequently, achieving and maintaining weight loss represents an effective strategy for mitigating thyroid cancer risk by ameliorating obesity-related pathogenic pathways, with physical activity serving as an evidence-based intervention modality. Female

thyroidectomy patients with insufficient levothyroxine treatment are more likely to experience debilitating fatigue and other symptoms that profoundly influence daily functioning and well-being. Exercise has become widely recognized as a management strategy for reducing fatigue and improving quality of life.[60] Following thyroidectomy in thyroid cancer patients, long-term suppressive therapy with levothyroxine may lead to bone mineral density loss, thereby elevating the risk of osteoporosis and fragility fractures.[61,62] Evidence from observational studies suggests that in thyroid cancer patients aged >40 years post-thyroidectomy, maintaining or initiating regular exercise may reduce fracture risk by preserving bone mineral density and musculoskeletal function.[63] Thus, further research is needed to explore an integrated exercise protocol that benefits for thyroid cancer survivors.

Although bibliometric mapping reveals the intellectual structure of thyroid cancer, it does not assess the quality of the underlying evidence. The top 5 references with the strongest citation bursts[31,33,34,36,50] were evaluated in this study, suggesting that the knowledge base is built based on high-quality observational studies, such as prospective cohorts and pooled analyses. The findings provide strong Level II evidence but remain subject to the inherent limitations of observational designs. The absence of randomized trials highlights a key gap and the need for future research to establish causal inference.

Limitations

To our knowledge, this study represents the first bibliometric analysis and visualization of research on physical activity in thyroid cancer. However, there are also inherent limitations associated with bibliometric methods. First, our literature from WoSCC and PubMed databases was only included, potentially omitting papers not indexed in this platform. Second, our analysis was solely limited to English-language publications, which may exclude significant non-English contributions. Third, our search strategy was not restricted to empirical studies, allowing the resulting datasets and subsequent analyses to incorporate non-empirical publications. Furthermore, future research with a comparative bibliometric approach based on citation bursts across multiple cancer types would be highly valuable to discern common patterns and unique trajectories in the evolution of cancer research.

Conclusions

This bibliometric analysis provides an overview of the results of thyroid cancer and physical activity research worldwide. There has been an exponential growth trend in research on thyroid cancer and physical activity since 2009. Thus, thyroid cancer and physical activity are emerging research areas that are likely to grow in importance. The United States is the country that produces more scientific knowledge on the topic addressed. *Thyroid* is the most attractive journal for researchers of thyroid cancer and physical activity. In addition, early research predominantly focused on foundational clinical topics, while recent trends increasingly emphasize metabolic health and patient-centered outcomes.

Our analysis provides robust evidence that regular physical activity is associated with a lower risk of developing thyroid cancer and improved clinical outcomes. This finding has important clinical and public health implications, suggesting that promoting exercise is an effective strategy for the primary prevention of thyroid cancer at the population level. Future interventions should focus not only on translating this evidence into actionable lifestyle recommendations to reduce the disease incidence but also on developing exercise regimens tailored for these patients.

Ethics Approval and Consent to Participate

Ethics and consent to participate were not required for this study.

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Disclosure

The authors declare no conflict of interests.

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