Research Article

Bias and Motivation of Energy Monitoring during Exercise under Scientometric Perspective

Gang Chen 1, Yuqing Su 2, and Mohd Asif Shah 3

1School of Physical Education, Nanjing Xiaozhuang University, Nanjing, China
2Department of Tourism and Nutrition, Nanjing Jinling Technical Vocational College, Nanjing, China
3Bakhtar University, Kabul, Afghanistan

Correspondence should be addressed to Yuqing Su; suyuqingnanjing@gmail.com and Mohd Asif Shah; ohaasif@bakhtar.edu.af

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The thermodynamics is of great value for better practical applications of Internet of Things (IoT). With the development of IoT, Wearable Energy Harvester can provide more abundant measurement methods for human engineering and human heat. However, how close the relationship is between traditional individual thermal measurement and emerging technologies remains a topic that has not been paid attention to. Therefore, this paper first sorts and summarizes the literature of human calorimetry and then shows the cross field of Wearable Energy Harvester and traditional research using graph theory. Specifically, this paper presents the evolution of the research field in the form of dual-map overlays by characterizing the network structure and measuring the structural transformation of the knowledge network. With Web of Science as the data source and CiteSpace 5.0 software as the tool to make a knowledge graph for quantitative statistics, it is found that the research hotspot of individual energy expenditure is in the physiological field. The starting point of individual thermal energy monitoring technology represented by Wearable Energy Harvester is to aid with human health. However, as time progresses, although the development of this field still focuses on the fields of chemical industry and materials, it has gradually become closely related to multiple disciplines such as the monitoring of thermal energy during high-intensity sports training.

1. Introduction

Physical Activity normally refers to the physical activity generated by skeletal muscle contraction and the activity with increased body energy expenditure at the level of Basal Metabolic Rate (BMR). Life activities are accompanied by metabolism, including material metabolism and energy metabolism [1]. Material metabolism is the continuous exchange of substances between the human body and the outside world, including metabolic changes in two different directions: anabolism and catabolism [2]. Anabolism refers to the continuous conversion of nutrients ingested by the human body, including sugar, fat, protein, etc. into the tissue components of the body or renewal of aging tissue components. The continuous storage of energy during anabolism is called assimilation. Catabolism refers to the continuous decomposition of body tissue components [3]. The process of catabolism is accompanied by the release of energy for the human body to carry out various functional activities normally, which is called alienation [4]. Energy metabolism refers to the release, storage, and utilization of energy in metabolism [5, 6]. The development of the human body, the transformation, and repair of tissue components, and the energy required for various life activities are based on the continuous progress of metabolism [7]. In the study of human energy metabolism, it is necessary to clarify not only the daily energy intake from food but also the daily total energy demand and specific energy expenditure [8]. Therefore, the effective monitoring of energy expenditure in the process of exercise is of great significance to achieve the goal of doing sports scientifically. Studies have shown that too little physical activity can affect human health [9, 10]. Therefore, research on human heat and its expenditure has been a hot research field in Internet of Things (IoT). For
example, Nuzzo [11], Khobragade et al. [12], and Naser et al. [13] support that thermal energy monitoring system will rapidly form an advanced Internet of Things (IoTs) to guide industry and people's lifestyles and health, especially under the development of renewable technology [14–16].

However, is it a single subject topic or an interdisciplinary topic to achieve a more objective, reliable, convenient, and accurate measurement of energy expenditure in the process of human movement? The answer is unclear, which is the study object of this paper. In the study of human thermodynamics, there is still a lack of relevant literature to clarify the progress of discipline research. From the preliminary observation, the answer to this question is likely to be an interdisciplinary question. In the twenty-first century, to capture human heat, acceleration sensors and other instruments are used to extract and analyze human energy data [17, 18]. So far, commonly used mobile portable devices such as smart bracelets have been able to provide information about the number of steps, exercise distance, duration, energy expenditure, etc. of physical activity [19–21]. The monitoring of body heat from physical activity during exercise provides a reliable auxiliary for public fitness and professional training. However, it is obvious that science and technology for human thermal energy capture need to be based on two disciplines, namely, physiology and engineering technology. Most of the traditional research on energy expenditure focuses on physiological themes. However, in recent years, there has been a gradual rise in research that combines sports heat expenditure with wearable devices. For example, Kaplan [22] used Actigraph 7164 and multiaxis Actical accelerometer to verify a movable metabolic system. Children carried out 9 different activities, including complex whole-body movements while wearing the accelerometer. They found that when the data of all activities were put together, the accelerometer was very effective in distinguishing sedentary behaviour, and the prediction of moderately strenuous activity was relatively reasonable. However, for the high-intensity jumping activities, there was no data on the corresponding accelerometer to predict energy expenditure. There are other similar studies such as Jimmy et al. [23], Crouter et al. [24], and Buchan et al. [25]. Although complex aerobic exercise is included in the calculation of human heat expenditure, due to the complexity and extensiveness of physical activity [26–28], the studies do not provide clear information on the effectiveness of prediction by the accelerometer in high-intensity complex physical activity. Therefore, how to combine traditional physiological research and portable microsystem to predict energy expenditure in high-intensity complex exercise is a core problem to be solved, which obviously needs more in-depth interdisciplinary cooperation. However, at present, we are still unable to identify the obstacles to such interdisciplinary cooperation, what the current research bias is, and how to promote more effective and comprehensive cooperation in the future. These constitute the specific research problems that this paper intends to solve. Therefore, this paper takes the relevant literature of energy expenditure and Wearable Energy Harvest collected in the core collection of Web of Science (WOS) from 2000 to 2020 as the research object, draws the knowledge graph with CiteSpace tool, sorts and summarizes it from the perspective of metrology, and shows its phased research trend and bias at the same time.

2. Methodology

The core collection of the WOS database is used as the source database for retrieval. The way to obtain the literature about energy expenditure is to search the topics including "Human Energy Expenditure," "Exercise Energy Expenditure," and "Body Energy Expenditure" [29]. Timespan = 2000–2020, literature type = (article) or (review), a total of 594 literature titles were retrieved (retrieval date: December 24, 2020). In addition, in the same way, we obtained 1681 pieces of literature information about "Wearable Energy Harvest." The search information was set to “full record including the cited references” and saved in the format of download. tex, using CiteSpace Version 5.0 software to draw the knowledge network graph of the literature. CiteSpace information visualization software is developed by Professor Chen Chaomei of Drexel University based on citation analysis theory to extend the theoretical scope in Java language. It is one of the most characteristic and influential application software programs in visualization analysis of international literature information in recent years. CiteSpace uses computer algorithms and interactive visualizations to free people from some of the time-consuming and laborious burdens, allowing us to focus our efforts on more important and critical analysis problems.

The knowledge network graph can be used as a visual knowledge graph or a serialized knowledge pedigree. This paper divides the literature into two stages: 2000–2010 and 2010–2020, and uses the graphs of the two stages to analyze the hot spots and development trends of the field. However, for the relevant literature of "Wearable Energy Harvest," we have chosen to divide it into 2004–2010 and 2010–2020 because the starting year of the relevant literature is 2004. The overall comparison with energy expenditure can also make it more convenient for us to describe the research progress. At the same time, this paper uses the "JCR journal maps" function in CiteSpace software system to draw the dual-map overlay of the journal, explore the evolution process and development context of the knowledge base of academic journals, and reveal the knowledge diffusion and the law of knowledge dissemination. Then, this paper constructs the network structure transformation model to predict journals that may change the network structure in the field of citation analysis research in the future and look for journals that may cause changes in the network structure in the field of citation analysis research in the future.

3. Results

3.1. Description of the Research Hotspot. Based on the keywords related to energy expenditure, with the keywords of 594 documents published between 2000 and 2020 and the main fields of 304 journals retrieved from the WOS core collection as the source of research fields and hot spot
As can be seen from Figure 3, the research between 2004 and 2020 mainly focused on (1) polypyrrole (polypyrrole) including keywords mechanical energy, polypyrrole, water wave energy, etc.; (2) electronic skin (#2 electronic skin) including keywords supercapacitor, electronic skin, strain sensor, etc.; (3) energy harvesting (#2 energy harvesting), including keywords triboelectric nanogenerator, energy harvesting and piezoelectric nanogenerator, etc.; (4) electricity (#3 electricity), including keywords wearable electronics, electromagnetic generator, etc.; (5) body heat (#4 body heat) including keywords wearable device, carbon nanotube, etc.; (6) sensitized solar cell (#5 sensitized solar cell) including keywords lithium ion battery, graphene oxide, etc.; (7) flexible electronics (#6 flexible electronics) including keywords energy conversion, energy harvester, etc.; (8) performance (#7 performance) including keywords performance, harvesting biomechanical energy, etc.; (9) field effect transistor (#8 field effect transistor) including keywords electronics, field effect transistor, reduced graphene oxide, etc.; (10) modified gel polymer electrolyte (#9 PVDF-HFP) including keywords electrical conductivity, composite film (composite film), etc.
efficiency, ion batteries, sensitized solar cells, and wearable sensors from 2017 to 2018, and on research about nanoparticles, thermal conductivity, etc. from 2019 to 2020.

4. Dual-Map Overlay

The subject field is usually composed of elements like basic concepts, principles of scientific knowledge, etc. Reasonable and effective use of subject knowledge base can reveal the connection and development law of different knowledge systems within the subject. The knowledge base in different stages is drawn by using the JCR-based classification map in CiteSpace software. It should be noted that the left side of the map represents the subject field of the target literature set data, which is called the existing research field, and the right side represents the subject field of the references of the target data set, which is called the knowledge base field. The changes of a knowledge base can

**Figure 1:** Keywords cooccurrence timeline map from 2000 to 2010.
be clearly seen through the analysis of the subject field of the references of the target data set, and the diffusion of knowledge can be clearly seen through the analysis of the subject field of the target data set.

In the field of energy expenditure (see Figures 4(a) and 4(b)), the distribution boundary of related research from 2000 to 2010 is relatively vague, and its core fields are not very prominent. The research is mainly in the fields of
Table 2: Main keywords with the strongest citation bursts from 2011 to 2020.

| Keywords                      | Year | Strength | Begin | End   | 2011–2020 |
|-------------------------------|------|----------|-------|-------|-----------|
| Oxidation                    | 2011 | 2.01     | 2011  | 2014  |           |
| Adiposity                     | 2011 | 1.45     | 2011  | 2013  |           |
| Body fat                      | 2011 | 2.31     | 2012  | 2014  |           |
| Heart rate                    | 2011 | 1.49     | 2012  | 2013  |           |
| Coronary heart disease        | 2011 | 2.12     | 2013  | 2014  |           |
| Induced insulin resistance   | 2011 | 1.7      | 2013  | 2014  |           |
| Aerobic exercise              | 2011 | 2.22     | 2014  | 2017  |           |
| Energy intake                 | 2011 | 2.09     | 2014  | 2016  |           |
| White fat                     | 2011 | 1.74     | 2014  | 2016  |           |
| Uncoupling protein 1          | 2011 | 2.64     | 2015  | 2016  |           |
| Adaptive thermogenesis        | 2011 | 1.7      | 2015  | 2017  |           |
| PGC 1 alpha                   | 2011 | 2.53     | 2016  | 2018  |           |
| Glucose homeostasis           | 2011 | 1.9      | 2016  | 2017  |           |
| Glucose uptake                | 2011 | 1.5      | 2016  | 2018  |           |
| Adipose tissue                | 2011 | 4.45     | 2017  | 2020  |           |
| Human energy expenditure      | 2011 | 2.5      | 2017  | 2018  |           |
| Indirect calorimetry          | 2011 | 2.06     | 2017  | 2020  |           |
| PPAR gamma                    | 2011 | 1.94     | 2017  | 2018  |           |
| Weight                        | 2011 | 3.08     | 2018  | 2020  |           |
| Cold induced thermogenesis    | 2011 | 1.75     | 2018  | 2020  |           |

Table 3: Main keywords with the strongest citation bursts from 2004 to 2020.

| Keywords                      | Year | Strength | Begin | End   | 2004–2020 |
|-------------------------------|------|----------|-------|-------|-----------|
| Walking                       | 2004 | 4.97     | 2007  | 2015  |           |
| Electricity                   | 2004 | 3.03     | 2007  | 2016  |           |
| Generation                    | 2004 | 1.93     | 2007  | 2013  |           |
| Circuit                       | 2004 | 2.8      | 2008  | 2016  |           |
| Generating electricity        | 2004 | 3.84     | 2009  | 2015  |           |
| Conversion                    | 2004 | 2.5      | 2009  | 2014  |           |
| Energy harvesting             | 2004 | 5.18     | 2010  | 2014  |           |
| Ceramics                      | 2004 | 1.9      | 2010  | 2016  |           |
| Nanowire                      | 2004 | 2.72     | 2011  | 2015  |           |
| Driven                        | 2004 | 2.48     | 2012  | 2014  |           |
| Output                        | 2004 | 1.94     | 2012  | 2014  |           |
| Array                         | 2004 | 1.88     | 2012  | 2014  |           |
| Motion                        | 2004 | 4.05     | 2013  | 2015  |           |
| Nanogenerator                 | 2004 | 3.52     | 2014  | 2015  |           |
| Contact electrification       | 2004 | 2.96     | 2014  | 2015  |           |
| Battery                       | 2004 | 2.14     | 2014  | 2017  |           |
| Graphene                      | 2004 | 3.51     | 2015  | 2016  |           |
| Harvesting biomechanical energy| 2004 | 2.67     | 2015  | 2016  |           |
| Power source                  | 2004 | 2.25     | 2015  | 2016  |           |
| Network                       | 2004 | 2.25     | 2015  | 2016  |           |
| Electrification               | 2004 | 2.2      | 2015  | 2016  |           |
| Counter electrode             | 2004 | 2.09     | 2016  | 2017  |           |
| Conversion efficiency         | 2004 | 2.09     | 2016  | 2017  |           |
| Ion battery                   | 2004 | 2.09     | 2016  | 2017  |           |
| Pressure                      | 2004 | 1.74     | 2016  | 2017  |           |
| Sensitized solar cell         | 2004 | 2.7      | 2017  | 2018  |           |
| Wearable sensor               | 2004 | 2.16     | 2017  | 2018  |           |
| Nanoparticle                  | 2004 | 2.18     | 2018  | 2020  |           |
| Thermal conductivity          | 2004 | 1.92     | 2018  | 2020  |           |
“MEDICINE, MEDICAL, CLINICAL,” and the marginal fields are “NEUROLOGY, SPORTS, OPHTHALMOLOGY,” “MOLECULAR, BIOLOGY, IMMUNOLOGY,” “VETERINARY, ANIMAL, SCIENCE,” “PSYCHOLOGY, EDUCATION, HEALTH,” etc. In this period, the knowledge base is “1, 2, 5, 6, 7, 8, 9, 10, 11, 12,” of which is the 6th field and the core knowledge base.

Compared with the stage of 2000–2010, the human energy field has a clearer research field in the stage of 2011–2020, forming a core field of “MEDICINE, MEDICAL, CLINICAL” and “MOLECULAR, BIOLOGY, IMMUNOLOGY” and marginal fields of “NEUROLOGY, SPORTS, OPHTHALMOLOGY,” “PSYCHOLOGY, EDUCATION, HEALTH,” “VETERINARY, ANIMAL, SCIENCE,” etc. In this period, the knowledge base is “1, 2, 5, 6, 7, 8, 9, 10, 11, 12,” of which is the 8th field and the core knowledge base.

In the field of Wearable Energy Harvest (see Figures 5(a) and 5(b)), the distribution boundary of related research from 2004 to 2010 is clear. Its core fields are mainly the two of “PHYSICS, MATERIALS, CHEMISTRY” and “MEDICINE, MEDICAL, CLINICAL,” and the marginal fields are “ECOLOGY, EARTH, MARINE,” “VETERINARY, ANIMAL, SCIENCE,” “PSYCHOLOGY, EDUCATION, HEALTH,” etc. Compared with the stage of 2000–2010, the research fields involved in Wearable Energy Harvest in the stage of 2011–2020 are clearer, forming a pattern of “PHYSICS, MATERIALS,
“CHEMISTRY” and “VETERINARY, ANIMAL, SCIENCE” as the core fields. The core knowledge base from 2004 to 2010 is No. 4 on the right. The core knowledge base is diversified from 2011 to 2020, turning into No.1, No.4, No.6, NO.7, and No.8.

By observing the above overlay maps, it can be found that there is no obvious research bias in the traditional energy expenditure research before 2010, but after 2010, the research gradually begins to focus on research fields such as biomedicine. The research of Wearable Energy Harvest has focused on physical materials and chemistry since the beginning, and the purpose of the research is mainly for medical treatment, which is consistent with the development path traditional energy expenditure has taken. It shows that the initial research and development of Wearable Energy Harvest is to achieve interdisciplinary cooperation, but after 2010, the research of Wearable Energy Harvest has gradually diversified, unlike the traditional energy expenditure research that gradually focuses on a certain field. This shows that the research of Wearable Energy Harvest is moving towards multidirectional interdisciplinary cooperation. By observing the changes of keywords, it can be found that the research result has been used to assist multiple disciplines such as the monitoring of thermal energy in high-intensity sports training.

Figure 5: The dual-map overlay in the field of Wearable Energy Harvest. (a) 2004–2010. (b) 2011–2020.
5. Conclusions
This paper puts forward the problem of research bias on the energy expenditure in the process of human movement. Specifically, we hope to know whether it is single-disciplinary or multidisciplinary research on human movement energy. To achieve a more objective, reliable, convenient, and accurate measurement of energy expenditure in the process of human movement, there has been more and more abundant research, but no scholar has discussed the development trend yet. This paper takes the relevant literature of energy expenditure and sustainable energy harvest from 2000 to 2020 included in the core collection of Web of Science (WOS) as the research object, draws the knowledge graph using CiteSpace tool, sorts and summarizes it from the perspective of metrology, and shows its research trend and bias in different stages. As a result, it is found that the network density of energy expenditure related research is 0.0178 and that of Wearable Energy Harvest related research is 0.0096. Using the keyword burst terms detection technology (Burst analysis) in CiteSpace software, it is found that the overall energy expenditure research mainly focuses on human functions and biology, while Wearable Energy Harvest related research mainly focuses on engineering and material topics. However, through further dual-map overlay analysis it is found that, in traditional energy expenditure research, there is no obvious research bias before 2010, but after 2010 research gradually begins to focus on research fields such as biomedicine. The research of Wearable Energy Harvest has focused on the research of physical materials and chemistry since the beginning, and the results of the research are mainly applied in the medical field. This shows that the initial research and development of Wearable Energy Harvest is to achieve interdisciplinary cooperation in the medical field, but the research of Wearable Energy Harvest has gradually diversified. By observing the changes of keywords, it can be found that the research results have been applied to assist a variety of sports measurement needs such as the monitoring of thermal energy in high-intensity sports training.

However, at the end of this paper, we need to explain the limitations of this paper. First of all, as this paper is a scientometric study of WOS literature, all English literature cannot be considered in the acquisition of data. Therefore, articles retrieved from Google Scholar and other databases are not included in this research. In addition, in data processing, we cannot completely eliminate literature unrelated to the theme. For example, it is found that keywords also appear in some social science articles. Therefore, data cleaning may become the main further work in the future. Future research may focus on the drivers behind the current findings and the historical explanations that have shaped the current phenomenon.

Data Availability
The data used to support the findings of this study can be obtained from the corresponding author upon request.

Conflicts of Interest
The authors declare that there are no conflicts of interest regarding the publication of this paper.

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References
[1] L. M. Redman, S. R. Smith, J. H. Burton, C. K. Martin, D. Il'yasova, and E. Ravussin, “Metabolic slowing and reduced oxidative damage with sustained caloric restriction support the rate of living and oxidative damage theories of aging,” Cell Metabolism, vol. 27, no. 4, pp. 805–815.e4, 2018.
[2] S. K. Auer, C. A. Dick, N. B. Metcalfe, and D. N. Reznick, “Metabolic rate evolves rapidly and in parallel with the pace of life history,” Nature Communications, vol. 9, no. 1, pp. 14–16, 2018.
[3] J. A. Frangos, L. V. McIntire, and S. G. Eskin, “Shear stress induced stimulation of mammalian cell metabolism,” Bio-technology and Bioengineering, vol. 32, no. 8, pp. 1053–1060, 1988.
[4] M. Robertson, “Measurement andalienation: making a world of ecosystem services,” Transactions of the Institute of British Geographers, vol. 37, no. 3, pp. 386–401, 2012.
[5] R. L. Smith, M. R. Soeters, R. C. I. Wüst, and R. H. Houtkooper, “Metabolic flexibility as an adaptation to energy resources and requirements in health and disease,” Endocrine Reviews, vol. 39, no. 4, pp. 489–517, 2018.
[6] A. Mika, F. Macaluso, R. Barone, V. Di Felice, and T. Sledzinski, “Effect of exercise on fatty acid metabolism and adipokine secretion in adipose tissue,” Frontiers in Physiology, vol. 10, p. 26, 2019.
[7] B. H. Goodpaster and L. M. Sparks, “Metabolic flexibility in health and disease,” Cell Metabolism, vol. 25, no. 5, pp. 1027–1036, 2017.
[8] J. E. Blundell, C. Gibbons, K. Beaulieu et al., “The drive to eat in homo sapiens: energy expenditure drives energy intake,” Physiology and Behavior, vol. 219, Article ID 112846, 2020.
[9] J. Cairney, D. Dudley, M. Kwan, R. Bullen, and D. Kriellaars, “Physical literacy, physical activity and health: toward an evidence-informed conceptual model,” Sports Medicine, vol. 49, no. 3, pp. 371–383, 2019.
[10] A. V. Mattioli, S. Sciomer, C. Cocchi, S. Maffei, and S. Gallina, “Quarantine during COVID-19 outbreak: changes in diet and physical activity increase the risk of cardiovascular disease,” Nutrition, Metabolism, and Cardiovascular Diseases, vol. 30, no. 9, pp. 1409–1417, 2020.
[11] J. Nuzzo, “Volunteer bias and female participation in exercise and sports science research,” Quest, vol. 73, no. 1, pp. 82–101, 2021.
[12] P. Khobragade, P. Ghutke, V. P. Kalbande, and N. Purohit, “Advancement in internet of things (Iot) based solar collector for thermal energy storage system devices: a review,” in Proceedings of the 2022 2nd International Conference on Power Electronics & Iot Applications In Renewable Energy And Its Control (PARC), pp. 1–5, IEEE, Mathura, India, 2022, January.
[13] A. Naser, A. Lotfi, and J. Zhong, “Calibration of low-resolution thermal imaging for human monitoring applications,” IEEE Sensors Letters, vol. 6, no. 3, pp. 1–4, 2022.
W. H. Zhang, L. C. Chou, and M. Chen, “Consumer perception and use intention for household distributed photovoltaic systems,” *Sustainable Energy Technologies and Assessments*, vol. 51, Article ID 101895, 2022.

Y. Bai, L. Chou, and W. Zhang, “Industrial innovation characteristics and spatial differentiation of smart grid technology in China based on patent mining,” *Journal of Energy Storage*, vol. 43, Article ID 103289, 2021.

M. Chen and W. H. Zhang, “Purchase intention for hydrogen automobile among Chinese citizens: the influence of environmental concern and perceived social value,” *International Journal of Hydrogen Energy*, vol. 46, no. 34, pp. 18000–18010, 2021.

M. Cai, Z. Yang, J. Cao, and W. H. Liao, “Recent advances in human motion excited energy harvesting systems for wearables,” *Energy Technology*, vol. 8, no. 10, Article ID 2000533, 2020.

Y. Cheng, K. Wang, H. Xu, T. Li, Q. Jin, and D. Cui, “Recent developments in sensors for wearable device applications,” *Analytical and Bioanalytical Chemistry*, vol. 413, no. 24, pp. 6037–6057, 2021.

A. S. Kaplan, “Development of Two-Regression Models to Predict Energy Expenditure in Youth Using a GENEActiv and Axivity AX3 Activity Monitor,” Master’s thesis, University of Tennessee, Knoxville, TN, USA, https://trace.tennessee.edu/utk_gradthes/5149, 2018.

S. Mondal, N. Zehra, A. Choudhury, and P. K. Iyer, “Wearable sensing devices for point of care diagnostics,” *ACS Applied Bio Materials*, vol. 4, no. 1, pp. 47–70, 2020.

A. S. Kaplan, “Development of Two-Regression Models to Predict Energy Expenditure in Youth Using a GENEActiv and Axivity AX3 Activity Monitor,” Master’s thesis, University of Tennessee, Knoxville, TN, USA, https://trace.tennessee.edu/utk_gradthes/5149, 2018.