Outpatient physical therapy in the municipalities and macroregions of Minas Gerais: an ecological study

Fisioterapia ambulatorial nos municípios e macrorregiões de Minas Gerais: estudo ecológico

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Abstract

Introduction: Specialized care in outpatient physical therapy (PT) can be provided through secondary health care, which involves more specific and complex technological resources than primary health care. Despite the large percentage of professionals providing services at this level of care, access to PT services is unequal and relatively lacking in Brazil. **Objective:** To identify the percentage of municipalities with outpatient PT services by macroregion in Minas Gerais (MG) and to evaluate the attendance coefficient for PT services according to the population sizes of the municipalities. **Methods:** This was an ecological study of data from the Outpatient Information System of the Unified Health System (SUS) and population data from the 2022 Census. The municipalities were categorized into five groups (small I, small II, medium, large, and metropolis). The Kruskal-Wallis and Mann-Whitney tests were used to compare the attendance coefficients between the groups. The municipality of Belo Horizonte was excluded from the nonparametric analysis because it was the only one classified as a metropolis. To clarify care gaps and visualize asymmetry in the attendance coefficients, a georeferencing map was constructed. **Results:** The coverage of outpatient PT services was 58.1%. The West macroregion, which is composed of 53 municipalities, had the highest PT care in MG and all of Brazil were 0.19 and 0.24, respectively, whereas the median coefficient for all municipalities was 0.18 (Q1 and Q3: 0.08 and 0.34, respectively). No significant differences were found in the attendance coefficients among the four groups. Twelve municipalities presented atypically positive values and were thus identified as care references. **Conclusion:** The availability and provision of outpatient PT services by the SUS are relatively lacking and heterogeneous among the different municipalities and macroregions of MG. The size of the municipality is not a relevant indicator of the proportional number of outpatient care. The Ministry of Health from Brazil must establish guidelines defining care referrals for PT services.

Keywords: Secondary health care. Physiotherapy. Secondary data analysis. Disparities in health care. Outpatient information system.

Resumo

Introdução: *A assistência especializada em fisioterapia no formato ambulatorial encontra-se na atenção secundária à saúde, onde é prestado o atendimento com recursos tecnológicos mais específicos e complexos. Apesar do grande percentual de profissionais atuando neste nível de atenção, o acesso aos serviços de fisioterapia é desigual e insuficiente no Brasil.* ***Objetivo:*** *Identificar a porcentagem de municípios com serviço de fisioterapia ambulatorial por macrorregião de Minas Gerais (MG) e avaliar o coeficiente de atendimento para o serviço de fisioterapia conforme o porte populacional dos municípios.* ***Métodos:*** *Trata-se de um estudo ecológico de dados do Sistema de Informações Ambulatoriais do Sistema Único de Saúde (SUS) e população do CENSO 2022. Os municípios foram classificados em cinco grupos (pequeno I, pequeno II, médio porte, grande porte e metrópole). Para a comparação do coeficiente de atendimento entre os grupos, utilizaram-se os testes Kruskal-Wallis e Mann-Whitney. Belo Horizonte foi excluído da análise não paramétrica por ser o único município classificado como metrópole. Para demonstrar os vazios assistenciais e a assimetria dos coeficientes de atendimento, elaborou-se um mapa de georreferenciamento.* ***Resultados:*** *A cobertura do serviço ambulatorial de fisioterapia foi de 58,1%. A Macrorregião Oeste, composta por 53 municípios, ocupou a primeira posição no ranking de cobertura. Os coeficientes de atendimento fisioterapêutico de MG e Brasil foram de 0,19 e 0,24, respectivamente. A mediana dos coeficientes de todos os municípios foi de 0,18 (Q1: 0,08 - Q3: 0,34). Não foram encontradas diferenças significativas dos coeficientes de atendimento na comparação entre os quatro grupos. Doze municípios apresentaram valores positivamente atípicos, sendo identificados como referências assistenciais.* ***Conclusão:*** *A oferta e produção dos serviços de fisioterapia ambulatorial pelo SUS é ausente e heterogênea entre os diferentes municípios e macrorregiões de MG. O tamanho do município não é um indicador relevante para a quantidade proporcional de atendimentos. Existe a necessidade de diretrizes do Ministério da Saúde para a definição de referências assistenciais para os serviços de fisioterapia.*

Palavras-chave: *Atenção secundária à saúde. Fisioterapia. Análise de dados secundários. Disparidades em assistência à saúde. Sistema de informações ambulatoriais.*

Introduction

Physiotherapy is a profession with an emphasis on specialized actions since its origins.[1] Specialized care in outpatient physical therapy is provided in the secondary level of health care, which involves more specific and complex technological resources than primary health care.[2] The results of a survey by the National Registry of Health Establishments revealed that 63.58% of the 133,212 Brazilian physical therapists work in the public health system.[3] Despite this relatively high percentage, access to physical therapy services is unequal and insufficient throughout Brazil.[4]

In 2008, the national physiotherapeutic services attendance rate was 0.19; the Southeast region experienced the highest attendance rate (47%), while the Midwest region of the country experienced the lowest (4%).[5] However, these values may be insufficient, as the needs for musculoskeletal rehabilitation, one of the main predictors of health loss and years lived with disability in both sexes, are increasing.[6] In addition, there is evidence of greater demand among individuals over 50 years of age.[7,8] Balancing the needs, demands and access of the population to health services is a key challenge for public managers. This challenge exists due to shortage of professionals,[9] barriers to the use of services[10,11] and the asymmetric distribution of physical therapists in the public health network.[4] This imbalance results in pent-up demand and, consequently, increased waiting times for care.[12] Thus, the principles of comprehensiveness and resolution of the Unified Health System (*Sistema Único de Saúde*, SUS), as recommended by law,[13] are not operationalized.

In Goiás, 69.9% of the municipalities reported a deficiency in the coverage of physical therapy services.[14] However, no studies to date have related the provision of medium-complexity physical therapy services with the population of the municipalities that compose each macroregion of Minas Gerais. Evaluations of physiotherapy services occur in isolation in the municipalities, and subsidies for good management practices within the system are lacking. Thus, there is insufficient evidence to create guidelines for the provision and management of physiotherapy services.

From this perspective, the present study aims to identify the percentage of municipalities with outpatient physical therapy services by macroregion in Minas Gerais and to evaluate the attendance coefficients for physical therapy services according to the population sizes of the municipalities.

Methods

This was an ecological study conducted with population data from the 2022 Census of the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, IBGE)[15] and outpatient physical therapy services provided in the year 2023, obtained from the Outpatient Information System of the SUS.[16] These data are managed by the federal government through the Department of Health Care together with the State Department of Health and the Municipal Departments of Health and are processed by the Department of Informatics of the SUS of the Executive Department of the Ministry of Health from Brazil.

The procedures in the Outpatient Information System are divided into eight groups: 1 - Health promotion and prevention actions; 2 - Diagnostic procedures; 3 - Clinical procedures; 4 - Surgical procedures; 5 - Organ, tissue and cell transplantation; 6 – Medical procedures; 7 - Procedures related to orthoses, prostheses and special materials; and 8 - Complementary health care services. The physical therapy service, classified as medium complexity in the SUS, is within the group of Clinical procedures with code 0302.[16]

The state of Minas Gerais, which consists of 853 municipalities, is part of the Southeast region and is the second most populous state in Brazil. In accordance with the Master Plan for Health Regionalization, the state is divided into 16 macroregions, with 19 reference municipalities that form the Macroregional Pole. This document is a planning and management tool that aims to direct decentralization to promoting greater and more adequate access for users in accordance with the principles of integrality, equity and economy of scale. This document establishes a territorial and population basis for calculating needs and prioritization for resource allocation and programmatic decentralization.[17]

Variables

The study variables included the total populations of Brazil and of Minas Gerais and its municipalities; the number of physical therapy outpatient appointments in the municipalities of Minas Gerais in 2023; the classification of the municipalities of Minas Gerais by macroregion according to the Regionalization Master Plan; and the classification of municipalities into five groups according to population size: small size I (population up to 20,000 inhabitants), small size II (population of 20,001 to 50,000 inhabitants), medium size (population 50,001 to 100,000), large size (population of 100,001 inhabitants to 900,000 inhabitants), and metropolis (over 900,001 inhabitants).[18]

Data sources and measurement

The following steps were performed to filter and retrieve the data: 1) Selection of the "Health Care" option; 2) Selection of the "Outpatient Production (Outpatient Information System)" option; and 3) Selection of the "By location of care from 2008 onwards, geographical coverage: Minas Gerais". Finally, within the "Available selections" option, the code corresponding to physical therapy (0302) in the "Procedure subgroup" item was selected.[16]

The attendance coefficients were calculated by dividing the number of physical therapy appointments in the year 2023 by the population of the corresponding municipality according to the 2022 IBGE Census.

Bias control

To control for bias, standardized collection procedures on public platforms and data conferences were adopted. Four researchers were responsible for collecting the data and performing the calculations, while two researchers subsequently checked their results.

Statistical methods

The data were exported and organized into a database using Microsoft Excel 2016 (Redmond, Washington, USA). JASP software version 019.3 was used for descriptive statistical analysis and hypothesis testing.[19] To verify the distribution of the data, the Shapiro-Wilk test was used, the results of which indicated that the data were not normally distributed. To compare the coefficients of attendance among municipalities of different sizes, the Kruskal-Wallis and Mann-Whitney tests were used. The municipality of Belo Horizonte was excluded from the nonparametric analysis because it was the only municipality classified as a metropolis.

To demonsrate the care gaps and the asymmetry in the assistance coefficients of the municipalities, a georeferencing map of the territory of Minas Gerais was constructed using QGIS version 3.34.11-Prizren for

Windows.[20] The cartographic database was provided by the IBGE[21] as shapefile: *Brazil – Minas Gerais. 2022 SHP*. Measures of central location and dispersion (medians and quartiles) were used as the cut-off points to visualize the coefficients on the map.

Access to data and cleaning methods

All the data were collected and exported from the corresponding platforms on August 2024 by four previously trained researchers. Two researchers checked the information in the databases.

Data pairing

The data from the different platforms of the municipalities, Minas Gerais and Brazil were manually paired, after which the VLOOKUP function of Microsoft Excel 2016 was used to record the data in a single database.

Ethical aspects

The study was conducted with secondary data sources provided by the public domains of the Department of Informatics of the SUS and IBGE, ensuring the confidentiality and anonymity of the individuals. Therefore, it was not necessary to submit the project to a Research Ethics Committee.

Results

In Minas Gerias, physical therapy services were offered by 58.1% of the total number of municipalities. The 496 municipalities of Minas Gerais that offer outpatient physical therapy care are distributed across 16 macroregions. The West macroregion had the best coverage for physical therapy care. The total number of municipalities per macroregion, the number of municipalities with outpatient physical therapy care services and the percentage of municipalities with physical therapy care services are described in Table 1.

A map of Minas Gerais showing the spatial distribution of the outpatient clinic attendance coefficients in all municipalities in the state is shown in Figure 1. The figure reveals care gaps in the North, East, Jequitinhonha, Northeast and Steel Valley macroregions. The median coefficient of atten-dance for all municipalities was 0.18 (Q1, Q3: 0.08, 0.34).

Table 1 - Total number of municipalities, number of municipalities with outpatient physical therapy services and physical therapy coverage rate by macroregion in Minas Gerais - Brazil

Macroregion	Total*	n (%)**
1. West	53	44 (83.0)
2. Northern Triangle	27	20 (74.0)
3. Southwest	51	37 (72.5)
4. Southern Triangle	27	19 (70.3)
5. Northwest	33	23 (69.6)
6. South Centre	51	35 (68.6)
7. Southeast	94	61 (64.8)
8. Centre	101	65 (64.3)
9. Far South	53	32 (60.3)
10. South	50	30 (60.0)
11. South East	53	28 (52.8)
12. Northeast	57	29 (50.8)
13. Steel Valley	35	17 (48.5)
14. Jequitinhonha	31	15 (48.3)
15. East	51	21 (41.1)
16. North	86	20 (23.2)
Total	853	496 (58.1)

Note: *Total number of municipalities in the macroregion. **Number (%) of municipalities with outpatient physical therapy care

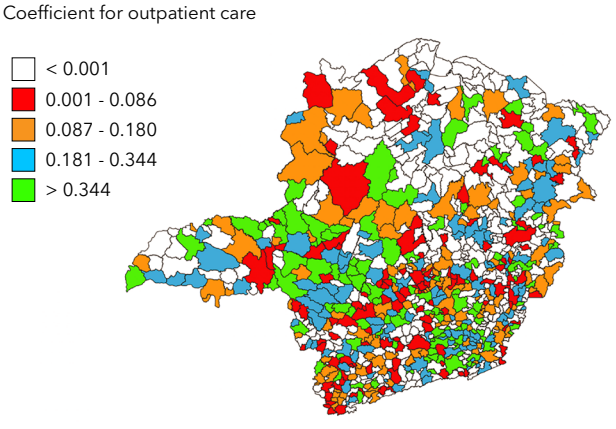

Figure 1 - Spatial distribution of the coefficients of attendance for outpatient physical therapy care in the municipalities of Minas Gerais - Brazil.

The coefficients of attendance for physical therapy care in Minas Gerais and Brazil were 0.19 and 0.24, respectively. Table 2 presents the data for the municipalities according to population size.

Table 2 - Descriptive data of the municipalities grouped by population size and results of the comparative analysis

Municipalities	Mean ± SD	CV	Median [Q1-Q3]	p-value *	Pairwise comparison	p-value**
Small size I (n = 334)	0.26 ± 0.29	1.11	0.17 [0.08-0.34]	-	1 - 2	0.513
Small size II (n = 90)	0.25 ± 0.22	0.89	0.18 [0.09-0.36]	-	1 - 3	0.922
Medium size (n = 38)	0.22 ± 0.18	0.82	0.16 [0.08-0.32]	-	1 - 4	0.247
Large size (n = 33)	0.26 ± 0.18	0.70	0.22 [0.13-0.33]	-	2 - 3	0.625
All (n = 496)***	0.25 ± 0.27	1.04	0.18 [0.08-0.34]	0.643	3 - 4	0.337

Note: SD = standard deviation; CV = coefficient of variation; Q1 = 1st quartile; Q3 = 3rd quartile. *Kruskal-Wallis test. **Mann-Whitney test. ***Belo Horizonte was excluded from the nonparametric analysis because it was the only municipality classified as a metropolis.

No significant differences in the attendance coefficients were found among the four sizes of municipality (Kruskal-Wallis, $p > 0.05$ for all analyses) or between each pair of municipality size (Mann-Whitney, $p > 0.05$ for all analyses). Municipalities with a population of less than 20,000 had the highest coefficient of variation. Figure 2 shows the representation of the coefficients of the municipalities according to population size. The figure shows similarities in the data distribution of medians and quartiles among the municipalities.

A greater number of outliers was observed in small municipalities with a population of less than 20,000 inhabitants (Group I). Information on these municipalities and on the pole municipalities of Minas Gerais can be found in Table 3.

The pole municipality of the best-performing macroregion, is Poços de Caldas (0.62), which, among all municipalities in Minas Gerais, was the 41st-best performing. The coefficients of twelve pole municipalities were better than those of Minas Gerais and Brazil.

Table 3 - Population, number of physiotherapy appointments and coefficients outpatient care of the outlier municipalities and macroregional pole municipalities

Ranking	Municipality*	Population	Number of PTA	Coeficient OC	Macroregion
1	Seritinga[6]	1,819	4,707	2.58	South
2	Francisco Badaro[174]	7,366	12,526	1.70	Jequitinhonha
3	Lassance[166]	7,124	11,733	1.64	North
4	Manhumirim[339]	20,613	30,677	1.48	South East
5	Vargem Bonita[12]	2,158	3,131	1.45	Southwest
6	Santana do Garambéu[11]	2,137	2,992	1.40	South Center
7	Perdizes[309]	17,151	19,146	1.11	Southern Triangle
8	Tombos[196]	8,609	9,608	1.11	Southeast
14	Santa Rita do Sapucai[416]	40,635	34,968	0.86	Far South
24	Cataguases[441]	66,261	51,212	0.77	Southeast
25	Santa Luzia[484]	218,805	165,010	0.75	Center
27	João Molevade[450]	80,137	59,430	0.74	Center
41	Poços de Caldas	163,742	103,023	0.62	Far South
77	Patos de Minas	159,235	73,203	0.45	Northwest
75	Barbacena	125,317	56,854	0.45	South Center
87	Juiz de Fora	540,756	233,487	0.43	Southeast
122	Ponte Nova	57,776	20,133	0.34	South East
130	Montes Claros	414,240	139,445	0.33	North

Note: PTA = physiotherapy appointments; OC = outpatient care. *Number of outliers in the database and highlighted in Figure 2.

Table 3 - Population, number of physiotherapy appointments and coefficients outpatient care of the outlier municipalities and macroregional pole municipalities (continued)

Ranking	Municipality	Population	Number of PTA	Coeficient OC	Macroregion
136	Ipatinga	227,731	75,840	0.33	Steel Valley
150	Teófilo Otoni	137,418	41,856	0.30	Northeast
163	Passos	111,939	32,265	0.28	Southwest
168	Pouso Alegre	152,217	40,164	0.26	Far South
175	Alfenas	78,970	20,736	0.26	Southwest
239	Divinópolis	231,091	42,052	0.18	West
287	Uberlândia	713,224	103,489	0.14	Northern Triangle
288	Varginha	136,467	19,167	0.14	South
325	Diamantina	47,702	5,488	0.11	Jequitinhonha
320	Belo Horizonte	2,315,560	255,022	0.11	Center
395	Uberaba	337,836	25,970	0.07	Southern Triangle
401	Governador Valadares	257,171	17,652	0.06	East
402	Manhuaçu	91,886	5,841	0.06	South East

Note: PTA = physiotherapy appointments; OC = outpatient care.

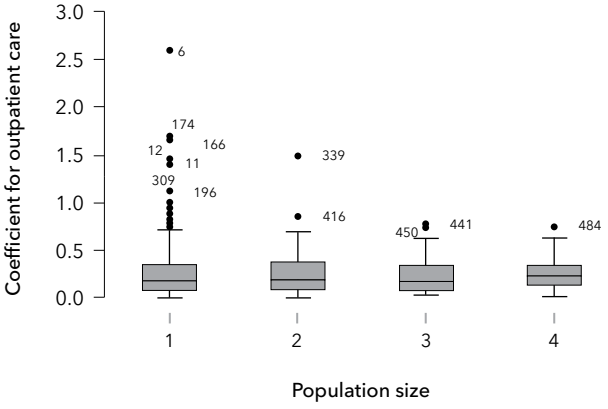

Figure 2 - Distribution of the coefficients of the municipalities according to population size (medians, quartiles, 10th and 90th percentiles and outliers).

Discussion

The present study investigated the coverage of outpatient physical therapy by macroregion in Minas Gerais. The results show that 58.1% of the municipalities offer outpatient physical therapy services through the SUS. The size of the population of the municipalities was not a determinant of the number of outpatient service, as there was no significant difference in the coefficient of attendance for outpatient care according to population size.

Belo Horizonte and other large cities, which offer referrals for medium- and high-complexity services, were expected to have higher attendance coefficients for outpatient services, since these municipalities have municipal, philanthropic and/or university hospitals; public and/or private physiotherapy service at teaching clinics; and polyclinics and other specialized services for chronic and endemic diseases. In contrast, however, the values for the capital and other macroregional pole or large municipalities did not reach the overall median.

Medium complexity services represent a "bottleneck" of the health care system, with problems related to the quality of the service, underfunding and little integration with other levels of complexity, which compromises the integration of health care. People who most need services are those who have the greatest difficulty in accessing them.[22] The principle of universality that guarantees all Brazilian citizens the right to access health care actions and services is often not obeyed, as some families lack access to services in their territory, and existing access is limited to a few individuals and services are scarce.[10] This problem has not been overcome over the years, given evidence of a lack of availability and asymmetry in care since 2011.[5] Therefore, the principles of universality and equity remain goals to be achieved in health care. [9,23]

Campo Grande has reported long waiting times for physical therapy appointments.[12] There is an insufficient

number of professionals,[9] barriers to the use of services[10,11] and an asymmetric distribution of physical therapists[4] and services[24] in the public health network. In addition, planning relevant actions is difficult because of the lack of data on the need and demand for physical therapy services at different levels of care. The consequent pent-up demand violates the operationalization of the principles of comprehensiveness and resolution recommended by Brazilian legislation.[13]

One of the problems of medium-complexity services is the funding model used for relevant procedures, as resource allocation is based on the number of services provided (production) and not on the clinical or functional needs of patients.[25] Different work processes for teams from rehabilitation centres,[26,27] the heterogeneous supply of orthoses, prostheses and special materials[28] and a lack of equity in the distribution of federal resources[29] are the realities of the Brazilian health system. Taken together, these factors contribute to regional differences in the distribution of public resources for physical therapy care.[30,31] This asymmetry may also occur due to a lack of clarity about the population requiring care.

One of the limitations of this study is related to the lack of reliability of the data, which was obtained from a public, secondary source and therefore may underrepresent the actual data. Specifically, the records in the databases may not accurately reflect information at the municipality level.[32] The SUS Outpatient Information System was implemented to aid in paying for the procedures performed, which may interfere with the recording of data due to both over- or underregistration.[33] The lack of information regarding the number and characteristics of the individuals assisted is a limitation for the epidemiological use of the data for research purposes and the management of health services; for example, the same person may have undergone several procedures in the same year, while other people may have had comparatively restricted access.

The filters used in the SUS Outpatient Information System can be improved to determine the number and demographic characteristics (age, sex, profession and occupation, for example) of the individual treated and not only the number and values of the procedures. Furthermore, the disease profile of the users treated by the services is not available in this information system. This is a limitation of this system, because the Hospital Information System offers the possibility of knowing hospital morbidity using the International Classification of Diseases (ICD). Thus, the Ministry of Health should provide information within the Outpatient Information System to determine this data for outpatients. Another idea for improving the system is inclusion of the International Classification of Functioning, Disability and Health (ICF) of the World Health Organization for providing indicators of functioning in health care.[34] These improvements could contribute to an understanding of the functional profiles of users with different health conditions, such as the sequelae of traffic accidents,[35] cervical cancer,[36] leprosy[37] or stroke.[38] Therefore, the results of the study allow knowledge of the supply of physiotherapy care with the outpatient production of the municipalities, but do not present the clinical or functional demands met by the services.

Population studies conducted in Pelotas in Rio Grande do Sul,[8] and in Lages in Santa Catarina[7] reported that the use of physical therapy throughout life or in the past 12 months increased progressively with the age of the patient, which is in accordance with the higher prevalence of chronic diseases after 50 years of age. Therefore, studies are needed to evaluate the relationships between the availability of services and the demands and needs of the population.

Despite these limitations, information systems offer procedures that allow service monitoring and auditing, which is an important strategy for control agencies and the population to inspect these services.[39] This system presents important information on the performance of health system managers in terms of knowledge of care priorities[40] and can serve as an auxiliary tool in planning and decision-making.[41]

Despite the need to balance the needs, demands and access of the population to health services, the topic is of low priority among municipal governments.[42] In addition, the public health system inadequately remunerates outpatient physical therapy services with respect to agreements made with private health establishments.[5]

The comprehensive nature of this type of study and the use of information from the Ministry of Health allow these methods to be replicated in other geographical areas and periods.[28,43–46] In addition, the analysis of the availability of outpatient physiotherapy services in all municipalities of a unit of the federation increases knowledge of care gaps, availability, coverage and government priorities, which can be leveraged to promote functionality, prevent disabilities and ensure rehabilitation.

The external validity of the present study is limited, as its results cannot be applied to other federal units, macroregions or municipalities. No pattern of provision could be identified for the different municipalities or macroregions. On the other hand, the methods used in the present study can be replicated to determine the gaps in the provision of outpatient care in different municipalities and federal units of Brazil.

Conclusion

The availability and provision of outpatient physical therapy services by the SUS are relatively lacking and asymmetric among the different municipalities and macroregions of Minas Gerais. The size of the municipality is not a relevant indicator of the proportional number of physical therapy care. The identification of gaps, variations and references for care can aid in the planning of actions by managers, professionals and users for effective social control of the health system. The Ministry of Health should establish guidelines for providing outpatient physical therapy services.

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Authors' contributions

PMOA and LF conceived and designed the study, and PMOA, MEHS, LHRS and ROC collected the data. All the authors analysed and interpreted the results, wrote and critically revised the manuscript, approved its final version and are responsible for all the aspects of the study, ensuring its accuracy. The data for all the municipalities of Minas Gerais used in the study are available at Mendeley Data, V1 (https://doi.org/10.17632/rnhytngjsn.1).

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