

# Methods of evaluating postural deviations of the spine used in national studies: a systematic review.

Métodos de avaliação de desvios posturais da coluna vertebral utilizados em estudos nacionais: uma revisão sistemática.

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## Abstract

**Introduction:** The spine related diseases have been increasing sharply and causing serious problems for public health. Having a postural assessment with one of the important factors in the prevention and/or treatment of these problems. Objectives: To determine which methods of spinal postural assessment has been used in studies and national journals published recently. Methods: This study is a systematic review, which followed the recommendations (PRISMA) "Transparent report of Systematic Reviews and Meta-analysis." The search data Began with the choice of key terms and synonyms following the Health Sciences Descriptors DeSC and MeSH (Medical Subject Headings). Due to achieve the main objective of the research, we selected only studies of national authors and journals published between the year 2013 to Feb/2014, yet fitting, made any kind of spinal postural assessment. Conducted a descriptive statistical checking the frequency percentages by software (IBM ® SPSS ® Statistic, vs 21, New York/USA 2012. Results: 25 studies were included, and the methods of evaluation were: photogrammetry (36.7%, n=11); Posturógrafo (16.7%, n=5); X-Ray (10%, n=3); Postural Visual Evaluation (23.3%, n=7) Goniometry (3.3%, n=1). Conclusions: it is concluded between national studies photogrammetry is the postural assessment methods most used today.

**Keywords:** Posture; Spinal Diseases; Measurement Equipment.

## Resumo

**Introdução:** As doenças relacionadas à coluna vertebral vêm crescendo abruptamente e gerando sérios problemas para saúde pública. Tendo a avaliação postural com um dos fatores importante na prevenção e/ou tratamento desses problemas. **Objetivos:** verificar quais métodos de avaliação postural da coluna vertebral vem sendo usados nos estudos e periódicos nacionais publicados recentemente. **Métodos:** Este é estudo de revisão sistemática, que seguiu as recomendações (PRISMA) "Transparent report of Systematic Reviews and Meta-análise". A busca de dados inciou-se com a escolha dos termos chaves e sinônimos seguindo os Descritores em Ciências da Saúde (DESC), e MeSH (Medical Subject Headings). Em virtude de atingir o objetivo principal da pesquisa, selecionaram-se apenas estudos de autores e periódicos nacionais publicados entre o ano de 2013 a Fev/2014, cabendo ainda, realizado qualquer tipo de avaliação postural da coluna vertebral. Realizou uma estatística descritiva verificando a frequência em porcentagens através do software (IBM® SPSS® Statistic, vs 21, Nova York/EUA, 2012. **Resultados:** Foram contemplados 25 estudos, e os métodos de avaliação encontrados foram: fotogrametria (36,7%, n=11); Avaliação Postural Visual (23,3%, n=7); Posturógrafo (16,7%, n=5); Raio-X (10%, n=3); Goniometria (3,3%, n=1). **Conclusão:** Conclui-se entre os estudos nacionais a fotogrametria é o métodos de avaliação postural mais utilizado atualmente.

**Palavras-Chave:** Postura; Doenças da Coluna Vertebral; Equipamentos de Medição.

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## INTRODUCTION

Currently those diseases related to spinal have been growing sharply causing serious problems for public health. Those which are responsible for much of absent from work, because, according to the Instituto Nacional do Seguro Social (INSS) in 2003 the problems related to spinal region, in particular pain in this region caused a total of 20,341 of the 387,950 work accidents.<sup>(1)</sup>

The spine problems when not congenital, may be from genetic, biological or even psychological.<sup>(2)</sup> And yet, it is believed that many other factors may cause postural deviations, and over time to provide serious the spinal problems. And among the factors that may cause postural deviations, we highlight the labor activities maintained for long periods in equal positions or movements;<sup>(3)</sup> obesity status,<sup>(4)</sup> large abdominal girth,<sup>(5)</sup> wrong practice and/or bad oriented physical activity,<sup>(6)</sup> or sports.<sup>(7)</sup> Generating an imbalance in the musculo-skeletal structures, causing postural deviations and different problems of spine.<sup>(8-10)</sup>

Postural problems can occur both in children<sup>(11,12)</sup> and adults and the elderly,<sup>(13,14)</sup> however, it is believed that the greater the age, the greater the likelihood of having postural deviations,<sup>(5)</sup> which can be justified second Aikawa, Braccialli, Padula<sup>(15)</sup> proper body posture is closely correlated with concepts of strength, balance, flexibility and neuromuscular coordination, along with all its mechanisms.

Postural deviations occur in various segments of the body, however, is believed to be the trunk, the body part most influential for maintaining body posture, being the axial skeleton of the human body,<sup>(16)</sup> and any changes that may significantly interfere with the body posture of the individual, thus causing limitations in personal activities, interfering negatively in habits and quality of life.<sup>(17-19)</sup>

Because there is a considerable increase in the prevalence of postural deviations, and problems arising from these it was sought to establish reliable methods of postural assessment, however, several methods have been used and improved over the years.<sup>(9)</sup> Thus, it is justified to determine which methods of postural assessment are currently being used, and detailed investigations on the spine while maintaining body posture can contribute understanding and measurement of postural control body misalignments, efficacy of therapeutic interventions, and consequently assist in the prevention and treatment of problems caused by poor posture.<sup>(9,20)</sup>

However, the aim of this study was to determine which methods of postural assessment of the spine have been used in studies and national journals published recently.

## MATERIAL E METHODS

This systematic review study,<sup>(21)</sup> which followed the

(PRISMA) recommendations "Transparent report of Systematic Reviews and Meta-analysis"<sup>(22)</sup> Being held in national databases and international databases: SciELO, PubMed and the search site Google Scholar (G.S) for having a large number of journals that are not available in the above bases. The selection and choice of studies were done by a Physical Education professional.

### Search for articles

There was a previous selection of terms and keywords, following the Descritores em Ciências da Saúde (DECS)<sup>(23)</sup> and of MeSH (Medical Subject Headings) dictionary for indexing articles in PubMed. After such a search, the terms were selected in Portuguese: Postura, Coluna, Doenças da Coluna Vertebral; Equipamentos de Medição, and English: Posture, Spinal, Spinal Diseases; Measurement Equipment. The terms were entered in the search sites, separated by Boolean operators "AND" and "OR". Still trying to capture all studies, also conducted a simple search with the terms "Postural Assessment AND Spine". The search and selection of articles referred to took place between Jan/2014 and Feb/2014.

### Articles inclusion criteria

In view to achieve the research objective, we selected only studies of Brazilian authors who have published in national journals between the years 2013 to Feb/2014, yet fitting, made any kind of postural evaluation of the spine in humans. Any studies of completion were awarded: Monographs, dissertations and/or theses.

### Eligibility Criteria

Studies that have gone through the initial filter, found some term in reading the title of the study were selected using the technique suggested by Lakatos, Marconi,<sup>(24)</sup> by reading the summary, and the case would meet the criteria, was realized thorough reading of Article ultimately choosing between inclusion or exclusion of the article. After all established criteria were considered for the survey 25 studies. Represented in Figure 1, through the organization schema and inclusion of studies in the search following.

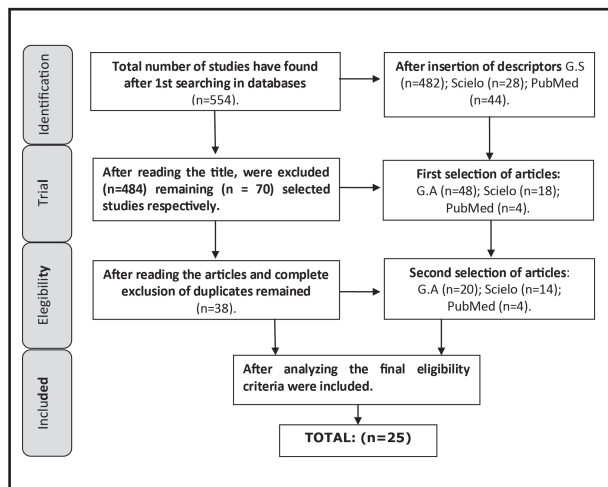
### Statistical Analysis

After done all collecting data, began a statistical analysis using software (IBM ® SPSS ® Statistic, vs 21, New York / USA 2012), checking through descriptive statistics only simple frequency shown in percentage in the methods postural assessment.

## RESULTS

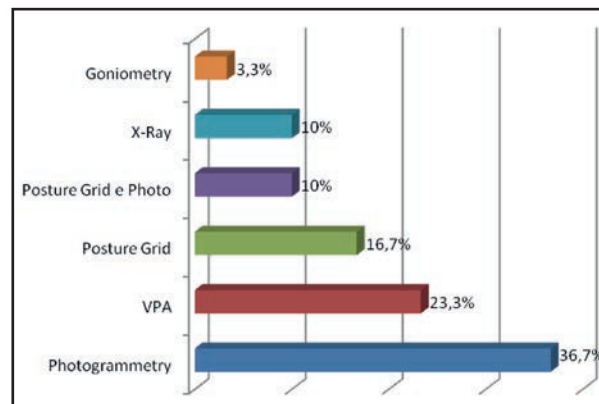
Were found 25 studies published in 2013, and among them, 06 different methods to assess postural deviations of the spine, still found in some of the meth-

ods found, 06 different software, these who assisted as-  
assessment, contributing to the method can be quantita-  
tive variables.



**Figure 1.** Flowchart of the studies included in the survey according to the eligibility criteria.

In Figure 2, it can be seen that among the six meth-  
ods of postural assessment in the studies, which was  
more present was photogrammetry, this amounted to a  
percentage of (36.7%, n = 11) of the studies included.



**Figure 2.** Percentage of the methods used in reviews.

Subtitle: VPA: Visual Postural Assessment.

**Table 1.** Displays the description of the contemplated studies.

Study	Year	Nº.	Methods	Soft
Barbosa et al. <sup>(35)</sup>	2013	85	Photogrammetry	Corel Draw®
Borges; Fernandes; Bertongello. <sup>(2)</sup>	2013	18	Photogrammetry	Sapo®
Bueno; Rech. <sup>(13)</sup>	2013	864	VPA	-
Colpo; Daronco; Balsan. <sup>(36)</sup>	2013	23	VPA	-
Comerlato; Scanegatta; Rosset. <sup>(30)</sup>	2013	01	Posturography & Photo	-
Cunha et al. <sup>(37)</sup>	2013	31	Photogrammetry	Sapo®
Dos Santos Pinto et al. <sup>(28)</sup>	2013	70	Posturography	-
Feijó et al. <sup>(38)</sup>	2013	18	Photogrammetry	APDIO
Ferreira; Barela; Barela. <sup>(16)</sup>	2013	20	Photogrammetry	APAS
Galo et al. <sup>(9)</sup>	2013	19	Photogrammetry	Posturograma®
Gimenes et al. <sup>(39)</sup>	2013	15	Photogrammetry	Sapo®
Kulsheski et al. <sup>(4)</sup>	2013	30	X-Ray	-
Lima et al. <sup>(40)</sup>	2013	16	VPA	-
Macedo et al. <sup>(41)</sup>	2013	09	Photogrammetry	Corel Draw®
Magalhães; Trippo; Lima Júnior. <sup>(42)</sup>	2013	19	Photogrammetry	Sapo®
Meireles et al. <sup>(43)</sup>	2013	60	Photogrammetry	-
Oliveira; Horodéski <sup>(27)</sup>	2013	01	Goniometry	-
Pereira et al. <sup>(44)</sup>	2013	262	VPA	-
Sedrez et al. <sup>(45)</sup>	2013	20	Posturography & Photo	-
Silva et al. <sup>(46)</sup>	2013	14	VPA	-
Sinzato et al. <sup>(29)</sup>	2013	33	Photogrammetry	Sapo®
Souza et al. <sup>(11)</sup>	2013	476	Posturography & X-Ray	-
Steidl et al. <sup>(47)</sup>	2013	13	VPA	-
Tamura; Gouvêa; Bertolini. <sup>(48)</sup>	2013	297	VPA & X-Ray	-
Valduga et al. <sup>(14)</sup>	2013	70	Photogrammetry	Sapo®

Subtitle: VPA: Visual Postural Assessment; APDIO: Postural assessment from digital image; APAS: Performance Analys System; Nº: Number of subjctcs.

## DISCUSSION

Can be seen in the present study that the method of computed radiography (X-ray), although in a few studies (10%,  $n = 3$ ), is still being used in academic studies. The x-ray is considered the most reliable methods "gold standard" for evaluation of deviations in the spine<sup>(25)</sup> by offering a vision of all his vertebrae and curves. However, the method also presents serious risks to the health of people exposed to this type of assessment, being an invasive method that exposes patients to damage to the body<sup>(26)</sup> since there are reports of cases that resulted in death. And the assessment carried out with X-ray pose risks to health, which studies have sought over the years establish a reliable methods, presenting no risk to health assessed, being practical and inexpensive.

And among the methods currently found in studies conducted in addition to the x-ray were found methods of visual postural assessment (VPA),<sup>(13)</sup> goniometer,<sup>(27)</sup> posturography<sup>(28)</sup> and photogrammetry,<sup>(29)</sup> or even some combination of these methods in the same assessment.<sup>(11,30)</sup> When discussing these methods, it is noticed that some are present predominantly subjective characteristics, being composed of qualitative analyzes, as in the case of VPA, and posturography.<sup>(8)</sup> However, with advancement in technology, have been developing methods that enable better measurement of the spine, faster and more reliably, transforming reviews before predominantly qualitative approach to quantitative assessments.

These changes aimed at more quantitative analysis, was also found in the present study because it was realized that although VPA and posturography are being used in the current study (23.3%,  $n = 7$ ) and (16.7%,

$n = 5$ ), respectively, the method was found more photogrammetry, which was present in (36.7%,  $n = 11$ ) of the studies.

This research confirmed that photogrammetry has been a widely used technique<sup>(31)</sup> and likely to increase, given that the insertion of images and postural assessment software is allowing postural assessments, estimate more precisely the postural deviations,<sup>(32)</sup> for a faster way, and the more subjective assessments, the period in which the reviewer takes to assess the measures of all angles of the body assessed on the person generates a lengthy process that can certainly affect the reliability of the measurements.<sup>(20)</sup> Photogrammetry has also proved superior to VPA when the Iunes<sup>(33)</sup> study showed greater concordance between the results. Moreover, since its validity and reliability had previously studied<sup>(32,34)</sup> and shown to be valid and reliable to measure linear and angular asymmetry in body posture by enabling measure angles and/or horizontal and vertical distances between the body segments.<sup>(31)</sup>

## CONCLUSION

It is concluded that the methods of postural assessment of the spine between the most used journal articles and national authors today are: photogrammetry, visual assessment, and posturógrafo. Photogrammetry being the most used method.

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