



Review Article

A review on musculoskeletal screening in girls and boys aged between 5 and 12 yearsDevyani Purushe¹, Prasad Dhage¹, Divyani Padole¹, Pratik Phansopkar¹, Neha Chitale^{1*}, Om C. Wadhokar¹

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ABSTRACT

Musculoskeletal complaints are very common in pediatrics. It is important to treat musculoskeletal disorders as soon as possible. Paediatric Gait, Arms, Legs, Spine (pGALS) is a rapid, quick musculoskeletal evaluation method evaluated in school-aged children to recognize joints that are abnormal. Musculoskeletal disorders may be associated with many diseases that interfere with everyday activities, from flat legs, genu valgum to extreme conditions as such infectious or juvenile idiopathic arthritis. It is easy to understand and quick to conduct the pGALS screening test. Initially, pGALS was created as a simple technique for non-specialists and adapted for adult patients from the early Gait, Arms, Legs, and Spine (GALS) test. Three questions about pain and function are included in pGALS, accompanied with a chain of basic manoeuvres to test all crucial joints to distinguish normal from abnormal. An effective strategy to improve understanding about the diseases of joint, enhance early identification of joint issues and also helps in promoting referral to the specialists team in order to improve clinical result is the learning of pGALS along with basic information. In spite of the time taken and pain caused, pGALS is useful to patients and parents. With a sensitivity and specificity of more than 97 percent, pGALS has been shown to be an easy-to-use top-to-toe musculoskeletal diagnostic tool for children. For both kids and their parents, it is appropriate and can be carried out easily, even by new examiners. Proper understanding of screening techniques for musculoskeletal disorders would allow for rapid diagnosis and early referral and care where appropriate.

Keywords: pGALS, musculoskeletal screening, musculoskeletal disorder, clinical skills, Musculo skeletal pain, Normal development, Paediatrics

Received - 10/06/2021, Reviewed - 29/06/2021, Revised/ Accepted- 20/07/2021

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INTRODUCTION

Musculoskeletal issues are common in infants. Children and adolescents also have musculoskeletal (MSK) diseases, which can pose to practitioners that are not trained in paediatric MSK medicine, such as orthopaedic, paediatric, adult rheumatology, family, or emergency medicine [1]. The number of MSK experiences in children are mild, self-limiting, but sometimes trauma linked; referring to an expert is not always necessary, and validation alone can be enough in certain situations [1]. Trauma-related and self-limiting children's musculoskeletal conditions are also a symptom of life-threatening malignancy or sepsis, such as leukaemia, septic arthritis or osteomyelitis, etc. Some diseases, including juvenile idiopathic

arthritis (JIA), can also cause children to be permanently disabled [2]. Paediatric Gait, Arms, Legs, and Spine is a good diagnostic tool for musculoskeletal anomalies in children who appear to be healthy. Increased pain is the most common musculoskeletal complaint in school-aged children, while hypermobility has been the most common physical abnormality. Hypermobility that is asymptomatic rather than symptomatic is more common. Knowledge of screening methods for musculoskeletal problems will allow for rapid diagnosis and, if necessary, early referral and treatment [2]. There is a scarcity of literature on the epidemiology of musculoskeletal disorders around the world. Just a few studies have used pGALS as a screening method, with the number of research using adult GALS. Except for one poll from

Lucknow including 1838 children in the age group 7–18 years, there has been no published epidemiological study on musculoskeletal issues in children using pGALS in India.

In children, paediatricians typically observe musculoskeletal manifestation's, sometimes in conjunction with a number of acute as well as chronic conditions. It clarifies the need for paediatricians to improve their clinical musculoskeletal abilities and provides a summary of the basic validated screening test (pGALS) as an approach to clinical assessment [3].

In paediatrics, musculoskeletal complaints are very common, comprising around 18% of the emergency department's symptoms. The differential diagnosis varies from extreme diseases that need emergent intervention to normal variants that only need the family to be reassured. A proper musculoskeletal evaluation is the main way to differentiate.

Gait, arms, legs, spine (GALS) is a locomotor screening framework introduced in adults to diagnose musculoskeletal disorders. Paediatric GALS (paediatric GALS) was created from adult GALS and has mostly similar features together with specific manoeuvres, since adult GALS lacked major ankle and foot, wrist and temporomandibular joints (TMJ) defects when it was first studied in children with JIA. For both parents and children, it is appropriate and can be carried out easily, even by new examiners [2]. For orientation, a clip on pGALS was shown in the class prior to the actual test. The investigative team screened up to five kids at the same time. Children who had pGALS screening results that were positive were given a detailed history and a regional clinical examination. Certain children are sent to a paediatric rheumatology clinic if necessary.

Paediatric Gait, Arms, Legs, and Spine (pGALS) monitoring is often a standardised screening method for youngsters which can be used to detect, refer, or further investigate red flags and the presence of major pathology in these children [4-6]. It requires a general musculoskeletal system evaluation which takes about 2 minutes to perform. By using this method with its three questions and easy physical exam steps, it would be almost impossible for paediatric residents not to neglect pathologies that would warrant investigations and referrals.

The screening test was checked and thoroughly researched. Research carried out at the University of Newcastle showed that when tested, pGALS had excellent sensitivity and specificity compared to examination by specialist paediatric rheumatologists, and the median time to complete the screening examination was found to be 2 minutes. Children and their parents were also surveyed for acceptability and found pGALS to be well received [7].

What does pGALS mean?

Paediatric GALS (pGALS) is a clear and easy-to-prove approach for musculoskeletal evaluation screening in school going children and has also shown on adult GALS (Gait, Arms, Legs, Spine) screening. Medical students are typically taught the adult GALS screen, and emerging research indicates an increase in the trust and performance of doctors in adult MSK evaluation. Sufficient educational tools are available to enhance GALS learning. PGALS is almost the only validated MSK paediatric screening test that was initially conducted in school-aged children. It has been shown that pGALS has good sensitivity for detecting anomalies (i.e. with some false negative), performs manoeuvres that are simple and widely utilised in day to day clinic practices, takes an average of 2 minutes and is easy to conduct. Furthermore, pGALS had proven about having higher sensitivity and its simple to perform when carried out by medical students, also general practitioners, with excellent acceptance by children and families. The screening manoeuvres can also be carried out very easily by younger children, although pGALS validation has yet to be demonstrated in the pre-school age group [8].

Why is it important for paediatricians to be familiar with Musculoskeletal medicine?

Musculoskeletal (MSK) manifestations in children are normal and can be caused by a number of reasons, the majority of which are mild and self-limiting. MSK symptoms, on the other hand, are commonly associated features of many chronic paediatric conditions such as cystic fibrosis, inflammatory bowel disease, psoriasis and arthritis, and may be presented of potentially serious circumstances such as cancer, vasculitis, sepsis, and non-accidental injury. Children with MSK problems are almost never seen by paediatric rheumatologists or orthopaedic surgeons, but rather by primary care or paediatricians, who will assess subsequent management and referral pathways to clinical services based on their findings. Paediatricians play an important role in the treatment of children and must gain "core" MSK clinical skills and expertise in order to handle patients effectively. Children with MSK problems are almost never seen by paediatric rheumatologists or orthopaedic surgeons, but rather by primary care or paediatricians, who will assess subsequent management and referral pathways to clinical services based on their findings. However, children with incident juvenile idiopathic arthritis (JIA) face a substantial delay in receiving specialist rheumatological care, which is important because early diagnosis improves outcomes. These findings could be caused by the fact that most UK medical schools do not teach paediatric MSK clinical skills as a "base" subject. Treatment is dependent upon competent MSK clinical knowledge, proper analysis of the findings (that is dependent on awareness about what to look and also "red flags" that require

concern), and understanding of that first steps (referral and management). The Royal College of Paediatrics and Child Health (RCPCH) recognises the need to improve MSK clinical performance, and the previously approved Competency Framework for training for doctors includes MSK clinical skills and expertise [9].

Children's Musculoskeletal Screening-pGALS

The ideal screening test enables the identification of valuable abnormalities with excellent sensitivity. An observer needs to conduct a complete and thorough review of concerned area after a screening examination. In the case of adult musculoskeletal procedures, the inclusion of GALS (Gait, Arms, Legs, Spine) screening as part of basic teachings at schools and colleges has tended to improve doctors' confidence in their performance during muscular assessment. Besides that, a systematic evidence-based approach has now been established to the Regional Analysis of Musculoskeletal System (REMS) based upon the concept of 'look, sound, shift' and it is taught to the students regularly. For school children, a paediatric variation of the GALS (called pGALS) was created plus used for evaluation. pGALS involves basic manoeuvres widely used in clinical practice, is easy to execute and appropriate to the infant [3].

How will children's musculoskeletal assessment vary from adults?

It's clear that the children in many respects are 'not small adults,' thus we mainly concentrate over the history-taking with physical inspection of musculoskeletal. Parents or caregiver also provides history that may be focused on other people's impressions and perceptions of incidents (like teachers) and may be quite ambiguous about complaints which are non-specific for say 'My child is limping' or 'My child is not walking quite right.' In terms that adults may understand, young kids may find it difficult to locate or explain pain. It is not unusual for young kids to dispute that they have discomfort when asked specifically and instead have behavioural changes (example- irritable behaviour or bad sleep), diminished ability or involvement in activity, handwriting abilities (like handwriting), or decreased movement milestones. Few kids are scared or shy and are unable to participate in process of consultation [8].

Evaluating the musculoskeletal condition of school children using pGALS

pGALS was used to evaluate the chosen schoolchildren. pGALS has been shown to have high sensitivity for detecting abnormalities, integrates common clinical manoeuvres, and is easy to use, taking only two minutes on average to complete. pGALS was first verified in school-aged children, and it was found to be extremely practical and appropriate. Three screening questions do not exclude further evaluation of the pGALS, whether there is an obvious musculoskeletal problem and a positive response or no MSK issues and a negative response.

When should pGALS be performed?

- Child with pain in the bone, joint or muscle
- Children who are unwell having pyrexia
- Child in the limp
- Delaying or reduction of motor milestones
- In the absence of a neurological disorder, the 'clumsy' kid
- Child having chronic diseases and a familiar relation of musculoskeletal presentations [8].

How do you distinguish pGALS from adult GALS?

This pGALS pattern is exactly the same as the adult GALS sequence with further screening manoeuvres for the ankle and foot (walking on the feet and thereafter on the tiptoes), wrists (palms held together and hands at the back-to-back) and temporomandibular joints (mouth opened and insert 3 of the child's own fingers) and elbow (touch and touch the sky) and spine changes. These additional manoeuvres were used when adults GALS was originally studied in children of school age because of lack of serious abnormalities at these sites [8].

The components in the pGALS screen

The first step in pGALS is to observe the child as they enter the room, their relationship with their care giver, and the participation of playing or games and also utilizing crayons or pencils. The children will be unclothed if possible, and if other CYP are unwilling to do so, patience and opportunistic examination are required. The assessment will be aided by a prior request for shorts and a T-shirt, as well as transparency to change. The child must be fully clothed, with his or her thighs exposed up to the thigh and knee, and his or her arms exposed up both to the elbows, but it is at the very least. The body will be exposed over time in order to examine the spine. The infant should be observed from the front, behind, and on the side while standing. The best way to examine the upper extremity and neck is to have the kid sit on an evaluation couch with his or her face to the examiner. The examiner's various manoeuvres can be copied by the child. The child should first lie down and have his or her legs examined, followed by a stand-up examination of his or her spine. The sequence of 'look, move, feel' adheres throughout pGALS, with checks for signs of discomfort, both verbal and nonverbal. It's crucial to make sure everything is symmetrical because the differences will be manipulative (joint swelling, muscle bulk, skin changes, deformity and range of motion).

Leg aligned problems like varus and valgus deformities is seen from the front and back, as well as muscle bulk. Scoliosis, which is more evident in forward flexion, perhaps indicated by uneven shoulder height or uneven creases throughout the skin on the trunk. Minor anomalies just at ankle (like valgus deformity or swelling) seem to be more noticeable there behind the infant. Leg length inequalities can be indicated by a flexed knee posture; if this is the case, careful examination of the spine is required to rule out juvenile scoliosis. The

pGALS observation of both the arms tests multiple joints for each integrated movement. Wrist flexion/extension (back to back and hands palm to palm), elbow extension (arms raised), or shoulder extension ("hands behind neck") are all signs of hypermobility.

Leg length (make sure the pelvis is upright and prevent false positives), alignment of muscle bulk (quadriceps wasting is common with JIA involving the knee), even posture are all part of the pGALS evaluation of both the legs with the child lying down (looking of valgus or varus deformity). When the legs are supine and extended, the lack of complete knee extension is most noticeable; loss of passive hyperextension at both the knee could be indicative of chronic joint disorder (especially if asymmetrical) and that may persist also as a measure of progress in active elderly.

Screening questions

- Is there any kind of pain or stiffness that you (or your child) have in your joints, muscles or back?
- Does it make it difficult without any support for you (or your child) to dress?
- Are you (or your child) having trouble going upstairs and downstairs?

Gait

- See as the kid walks around.
- "Walk on the tip-toes"
- "Heels walk"

Arms

- Place your hands in front of you right away.
- Roll over your hands for making a fist
- Pinch your thumb together with index finger
- Touch finger tips with the thumb"
- Squeeze your metacarpophalangeal joints
- Put together your hands and put your hands back to back
- "While reaching up, touch the sky"
- "Look up at the roof"
- "Place your hands behind the neck"
- Feel for effusion at the knee
- "Twist your knee and then straighten it"
- Passive flexion (90⁰) with an internal rotation of hip joint

Spine

- "Open your mouth and place your three fingers inside mouth"
- "Using your ear try touching the shoulder" Observe the spine from the back.
- "You can touch your toes by bending "-watch the curve of spine on both sides and back^[10].

The features of pGALS

The pGALS device is divided in 19 parts that assess posture, upper and lower limbs, spinal pain, motion restriction, and joint

disease. The questionnaire is conducted by health practitioners and, depending on the existence or absence of an MSK condition, it has been confirmed as positive or negative. A questionnaire is noted positive while at least one answer is negative and positive when every answer is negative.

Strength and limitation

Symptoms that are associated with musculoskeletal system are prevalent during childhood. About 5% of paediatric population have chronic, debilitating disorder which affects and interferes with the musculoskeletal system's everyday activities (MSK). Early detection of MSK disorders, including primary care, is important for diagnosis and treatment. This becomes critical to have a standard instrument in Spanish to screen for musculoskeletal disorders in the paediatric population. A valid tool for the Mexican population is the Paediatric Gait, Arms, Legs, Spine (pGALS) tool that can be modified to other Spanish-speaking countries^[11].

How to make a distinction in a musculoskeletal examination between normal and abnormal?

Knowledge of movement ranges, the search for asymmetry and careful examination of small changes are the key to distinguishing between normal and abnormal. In addition, it is crucial to remain aware of normal gait variants, limb balance and normal motor milestones for general practitioners, since they are one of the known causes of parent's concern, particularly in pre-school children, concerns could often be eased by reassurance and clarification. There may be a significant difference throughout the development of gait cycle behaviours; this could be family characteristics (e.g., 'bottom-shufflers' often walk later) and may be subjected to racial variation. Joint abnormalities in young people (such as 'chubby' ankles, knees, wrists, and fingers) can be subtle or hard to understand. It is helpful to search for asymmetrical changes, but in the case of symmetrical joint involvement, it may be falsely reassuring. Muscle wasting suggests chronic joint disease, such as the muscles of the quadriceps or calf, which might alert the physician for involvement of the knee or ankle. Ankle swelling is always measured best by the infant. The range of joint movements must be identical, and improved clinical practise can lead to a better understanding of the 'natural' range of childhood movements. Hypermobility might have been distributed or restricted to peripheral joints as with the arms and legs, but young women and non-Caucasian children often become mobile. Benign hypermobility is characterized by hyperextension symmetrical at the thumbs, elbows, knees with flat, pronounced feet having regular tiptoe arch. After exercise or as 'clumsy' children, prone to falls, children with hypermobility can have mechanical aches and pains. Non-benign causes of hypermobility are important to remember, like Marfan syndrome (that can be seen with elongated thin fingers and high palate

tall habitus) and Ehlers-Danlos syndrome. Genetically inherited, non-benign hypermobility can be discovered by examining family history (e.g. cardiac deaths in Marfan syndrome). A non-mobile flat foot suggests the absence of normal tiptoe arches, also warrant an evaluation (example- excluding coalition of tarsals), and neurological disorder may be demonstrated by high fixed arches and repeated toe walking. In contrast, the lack of joint mobility is often important, particularly if asymmetrical. Enhanced symmetrical bulk of the calf muscle associated with various kind of proximal myopathies and muscular dystrophy can suggest delayed milestones, such as walking or failure to leap (later than 18 months) [8].

Postural stability is the ability to hold the centre of mass standing still even during motion within the base of support, which is the collective effort of visual, motor and biomechanical systems. Pathologies that include all of these processes inevitably threaten postural stability [11]. The school postural screening program in developed countries has been a proven technique to promote early detection and prompt intervention in the event of any musculoskeletal abnormalities [12]. In malnourished adolescents, the incidence of musculoskeletal manifestations was found to be greater [13]. The number and distribution of affected joints, as well as the diagnostic evaluation and management, are all influenced by accurate joint assessment [13].

CONCLUSION

pGALS is a quick, rapid, validated musculoskeletal system assessment that can be used in school going children. The most common musculoskeletal complaint is rising discomfort, and hypermobility is the most common abnormality of the body in school-aged children. Hypermobility that is asymptomatic is more common than hypermobility that is symptomatic. It is helpful to recognize normal joint anomalies along with the detection of abnormalities which is not noticeable from just history taking. A significant step in raising understanding of the important role of joint examination plus promotion of early diagnosis of rheumatic disease in child is the teaching as well as learning of pGALS as a crucial clinical skill. Physical pain, for example, is reversible, and the cause and solutions must be studied.

List of abbreviations

1. pGALS- Paediatric Gait, Arm Leg and Spine
2. MSK- Musculoskeletal

Competing interests

The authors declare that they have no conflict of interest.

ACKNOWLEDGEMENT

All author made best contribution for the concept, assessment and evaluation, data acquisition and analysis and interpretation of the data.

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How to cite this article

Devyani P, Prasad D, Divyani P, Pratik P, Neha C, Om C. W, 2021. "A Review on Musculoskeletal Screening in Girls and Boys Aged between 5 and 12 years". *Jour. of Med. P'ceutical &Alli. Sci.* V 10 - I 4, 1256 P-3120-3124. doi: 10.22270/jmpas.V10I4.1256