University of Limerick
Master of Public Health

Module 2 Individual Assignment
Funding Proposal Template

SCREENING OF IDIOPATHIC SCOLIOSIS IN ADOLESCENTS FROM PUBLIC SCHOOLS IN A MUNICIPALITY OF SAO PAULO, BRAZIL

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1. Screening of Idiopathic Scoliosis in adolescents from public schools in a municipality of São Paulo, Brazil

2. Intervention Summary

The screening will be carried out on adolescents aged 10-16 years to detect early signs of Scoliosis. The context will be ten public schools in a municipality in the State of Sao Paulo, Brazil. Physiotherapists previously trained and informed of the project will perform the protocol. The procedure will be carried out on those adolescents who voluntarily agree to participate and whose parents authorize their inclusion through informed consent. Following Brazilian law, this intervention will be submitted for approval by the ethics committee. The protocol consists of applying the Adams test (Physiopedia 2020) to verify the existence of Scoliosis. The rotation of the trunk will be measured with a Scoliometer. All individuals who present a measurement greater than 5 degrees with the Scoliometer will be referred for a more comprehensive assessment to the corresponding medical department and will continue with the medical care protocol according to each case's complexity.

3. Problem statement

Scoliosis is a deviation of the spine (Lonstein 1994, Bunnel 2005); it is categorized as congenital, neuromuscular, or idiopathic. The majority of adolescents (85%) are affected by idiopathic Scoliosis (Lonstein 1994, Reamy and Slakey 2001, Neinstein and Chorley 2002). Sometimes the condition worsens and leads to a marked deformity that can become painful and cause respiratory problems (Lonstein 1994, Reamy and Slakey 2001, Bunnel 2005).

The worldwide prevalence of Scoliosis in adolescents varies between 0.47–5.2% (Konieczny et al. 2013). There are no robust epidemiological data in the South American countries regarding its prevalence (Penha 2016).

Idiopathic Scoliosis can generate emotional and physical limitations. (Zhang et al., 2011; Parent et al., 2009). One of the adolescents' concerns is body aesthetics; Scoliosis can create feelings of shame and affect their self-esteem (Carrasco and Ruiz, 2016).

When Scoliosis is not detected or treated, it can generate potential serious complications (Wong and Tan 2010). Some studies have reported an increase in mortality associated with cor pulmonale, pain,

and more significant physical limitations affecting the individual's personal life and work *(Nachemson 1979, Fowles et al. 1978).*

International Institutions report the benefits of early diagnosis (Richards and Vitale 2008, Horne et al. 2014). The patient can be monitored, prescribed non-invasive solutions such as bracing for patients at risk of increasing curvature (Stuart et al. 2013) and avoiding possible surgical intervention. Females at 10-12 age should undergo the screening twice, and males once at age 13 or 14 (Richards and Vitale 2008).

Besides, it saves costs to the health system and improves the patient's quality of life. However, Brazil lacks the health policy to implement scoliosis screening programs in schools and studies that show evidence of using a Scoliometer as a diagnostic device.

4. The main goal and objectives of your proposed intervention

This intervention's primary goal is to identify adolescents at risk of developing problems due to Scoliosis.

Objectives:

- Decrease the number of patients who are referred to the specialist doctor;
- Reduce the number of patients referred to an unnecessary Cobb radiological test;
- Apply other therapies (for example, rigid bracing);
- Detect signs of functional and structural Scoliosis;
- Prevent severe deformities;
- Avoid unnecessary surgeries;
- Prevent complications;
- Reduce treatment costs.

5. Logic Model

The Logic Model (figure 1) describes the intervention based on the fact that scoliosis screening has been suggested in treatment effectiveness, program, and technical efficacy.

5.1. Intervention Inputs: Structures and processes necessary to implement the intervention

In the preparatory phase, the project will be formalized with the selected schools' governing bodies. This geographic area was chosen because the researchers are located in Sao Paulo and are linked to a University center.

Meetings will be held with the schools' governing body to explain the scope of the intervention and its benefits. The project will be disseminated in the schools, and 10-16-year-old students will be invited to participate. Ethical aspects will be managed, such as approval by the program's ethics committee and the signing of the informed consent of the representatives of the students who voluntarily want to participate. The spaces destined for the screening will be adapted since not all public schools have an area available for these purposes.

The group of physical educators who will perform the intervention and the project coordinator (champion) will be selected and hired, and the scoliometers purchased. Table 1 describes a detailed budget of the required items. With the Information Technology Department's support, the formats to collect the students' demographic data, and the pertinent information to the screening protocol will be defined.

5.2. Intervention activities: The core components of the intervention

A protocol that has already been applied in similar programs will be used. First, the Adams test will be carried out to identify any deformity of the trunk. If there is any asymmetry, this will be measured with the scoliometer. Those cases with 5 degrees or more of the trunk rotation angle will be considered positive (Deepak et al. 2017). According to the case's complexity, patients will be referred to the health service that is part of the medical care network of the National Health System (SUS- Sistema Único de Saúde). There the patients will receive the follow-up and treatment that corresponds to each case.

5.3. Theory through which these activities may achieve outcomes

This intervention is aligned with the United Kingdom National Screening Committee about the principles to screen a disease. There is a solid knowledge of the natural history of idiopathic Scoliosis, and it is a public health problem (Wong 2010). The condition can be early detected. The treatment at the beginning of the disease is more beneficial than in its late phase. The forward bend test is not invasive and has does not exhibit potential physical and psychological risks. It will be used the scoliometer, which is the best instrument to screen Scoliosis, and the Forward bend test is no

invasive, simple, safe, and accepted by the target population. Patients with early detection are less likely to undergo surgery than those without screening (Labelle et al. 2013).

5.4. What the intervention is trying to achieve, and how?

This intervention is of a cross-sectional design and is not intended to be a diagnostic program. According to the protocol, adolescents detected as positive or suspected of having a positive diagnosis will be referred for diagnosis and treatment, which will reduce surgeries. Therefore, this small program adapts to the definition of screening because it is capable of detecting individuals who have Scoliosis from those who do not (Deepak et al. 2017).

5.5. Context that might impact this theory

Brazil does not have a national protocol to screen idiopathic Scoliosis in schools. The intervention here proposed has taken as reference the International Task Force's consensus about the value of performing screening based on the scientific evidence (Labelle et al. 2013).

The topic of screening of Idiopathic Scoliosis in adolescents has been a matter of in-depth debate of international organizations specialized in this subject (Labelle et al. 2013).

There are extensive studies on scoliosis screening; however, they are focused on prevalence or reports of screening interventions but minimal controlled trials and comparative studies (Beauséjour et al. 2013).

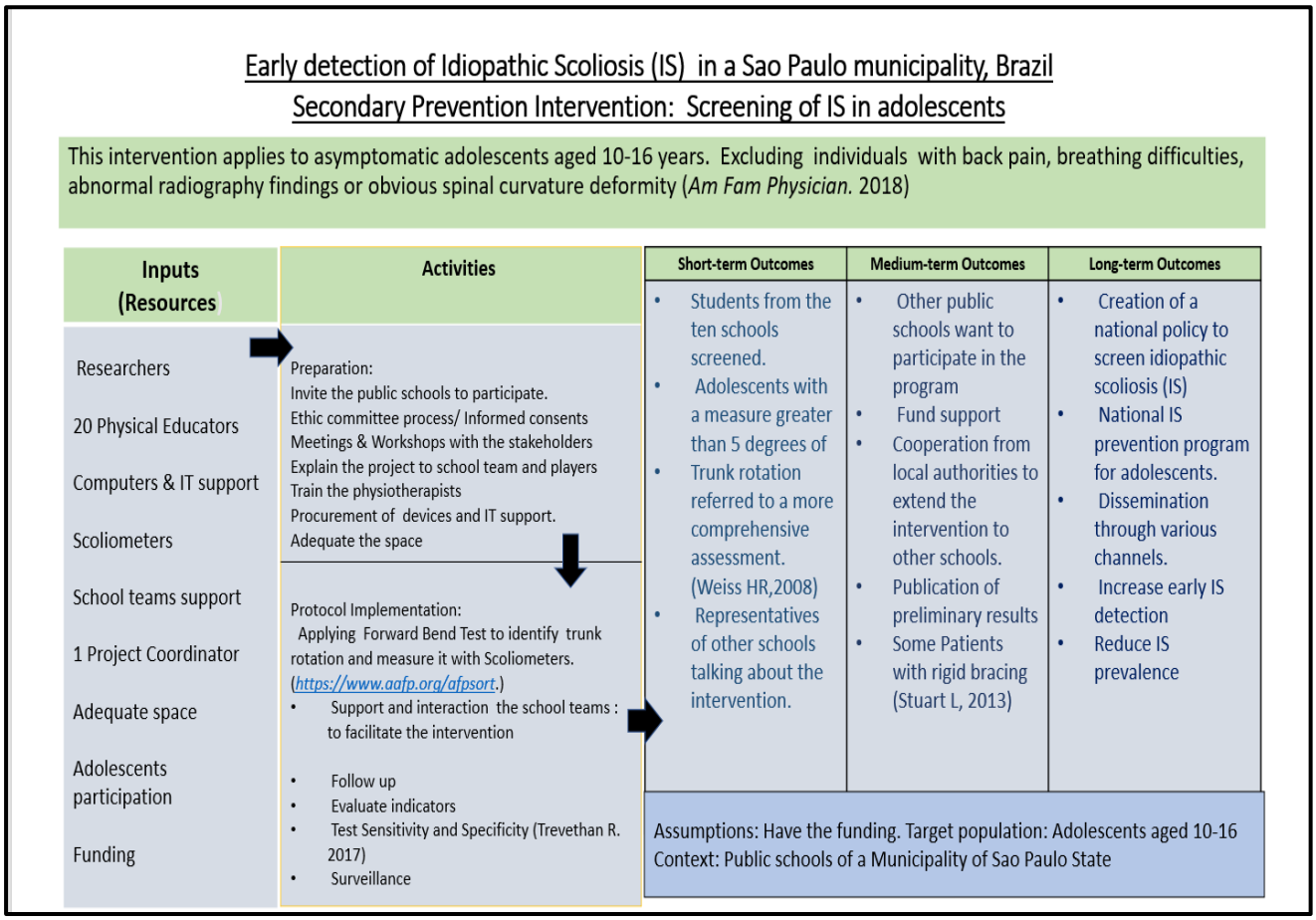
5.6. Short, medium, and long-term outcomes

Short term: Those adolescents with a measure greater than 5 degrees of trunk rotation will be referred to a comprehensive evaluation (Weiss HR, 2008). It is expected to execute the intervention according to the schedule without extra costs, and that representatives of other schools show interest in knowing the intervention.

Medium-term: Some patients using rigid bracing therapy (Stuart L, 2013). Other public schools want to implement the program and to have cooperation from local authorities to extend the intervention. The partial and total disclosure of this program's results will be presented in congresses and published in national and international scientific journals.

Long term: Increase early detection of Idiopathic Scoliosis and the reduction of its prevalence**.** Another relevant outcome is the creation of a national policy to screen idiopathic scoliosis which is part of a national prevention program.

Figure 1. Logic model: Early detection of idiopathic Scoliosis among adolescents in Brazil.



6. Evaluation approach

The evaluation will be focused on three aspects: Qualitative, Quantitative, and Surveillance.

6.1. Qualitative aspects:

Survey evaluate:

Perception of stakeholders? School team, Physical Educators, program coordinator (champion).

Student perception about the procedure? It was simple, safe? How was space?

Workshops and meetings with the stakeholders to understand the program pros and cons

6.2. Quantitative & Indicators:

Coverage: The number of adolescents who underwent the screening?

The number of cases with five or higher degrees of trunk rotation?

Prevalence of angle of trunk rotation for this group.

Characterization according to demographic and socioeconomic factors.

Do the patients with 5 degrees or higher, are receiving treatment? What kind of treatment?

Average time per test?

Cost per test?

Fidelity: The intervention was implemented according to the plan?

Any change or modification during the implementation?

Perform Sensitivity and Specificity tests: Proportion of True positives, False positives, True negatives, and False negatives. Other programs have reported a variety of positive predictive value between 20% to 70% of students diagnosed with idiopathic Scoliosis (Yamamoto et al. 2015).

6.3. Surveillance:

A methodical process of collecting, analyzing, and interpreting the data will be established since the intervention's preparatory phase. This will include demographic data to identify socio-economic conditions. The findings will be used to prevent and control of Idiopathic Scoliosis in adolescents.

It is expected to present the results of this intervention to the local health authorities. This evidence could be the initial base to discuss the need for a national program to screen idiopathic scoliosis among adolescents.

Based on the number of cases with 5 degrees or more of trunk rotation. Estimate the future costs associated with bracing therapy, and compare with the costs of surgery including diagnostic and hospitalization costs.

A limitation that we predict in this program's effectiveness is that we cannot guarantee that adolescents who test positive will go to their consultation at the referred health center. This is a voluntary program. Likewise, we cannot predict when the adolescents who need the bracing for treatment will receive it.

7. Detailed budget

Table 1 describes the items required to implement the program in 10 public schools.

Table 1: Detailed Budget required to implement the intervention.

Categories	Items	Cost	Justification
Preparatory Step	Meetings with the school committee. Support of a local educational institution. Physiotherapist Recruitment and selection, project coordinator. Ethics committee approval.	1.800	Human resources are required to execute the intervention. According to Brazil law, this intervention needs the approval of the Ethics committee.
Personnel	20 physical educators x 450 euros/ month	7.600	Required to execute the Adams test and Scoliometer measurement
Personnel	One project coordinator	900	Coordinate activities with the schools and stakeholders
Supplies & Materials	20 Scoliometers (40 euros/each)	800	Device required to measure control rotation
Supplies & Materials	Laptop (1.300) and It support (800)	2.100	Data collection
Infrastructure	Space adequacy (300 euros/ school)	3.000	Physical space to perform the screening
Publications	Peer review / open access journal	1.700	To create evidence
Evaluation	Ground transportation and meals of researchers and support team.	1.000	Support to the school teams
Dissemination	Congress, Media, and approach to authorities	1.000	Create awareness
Total		**19.900**	

8. References

Beauséjour, M., Goulet, L., Parent, S., Feldman, D.E., Turgeon, I., Roy-Beaudry, M., Sosa, J.F., Labelle, H. and Members of the Quebec Scoliosis Society and the Canadian Paediatric Spinal Deformities Study Group. (2013) 'The effectiveness of scoliosis screening programs: methods for systematic review and expert panel recommendations formulation,' *Scoliosis*, 8(1), 12, available: DOI: 10.1186/1748-7161-8-12.

Bunnell, W.P. (2005) 'Selective screening for Scoliosis', *Clinical Orthopaedics and Related Research,* (434), 40-45, available: doi: 10.1097/01.blo.0000163242.92733.66.

Carrasco, M.I.B. and Ruiz, M.C.S. (2016) 'Escoliosis idiopática adolescente: la experiencia de padecer una deformidad física', *Texto & Contexto - Enfermagem*, 25(2), 1-9, available: doi: 10.1590/0104-07072016003640014.

Deepak, A.S., Ong, J.Y., Choon, D., Lee, C.K., Chiu, C.K., Chan, C. and Kwan, M.K. (2017) 'The Clinical Effectiveness of School Screening Programme for Idiopathic Scoliosis in Malaysia,' *Malaysian Orthopaedic Journal,* 11(1), 41-46, available: DOI: 10.5704/MOJ.1703.018.

Fowles, J.V., Drummond, D.S., L'Ecuyer, S., Roy, L. and Kassab, M.T. (1978) 'Untreated Scoliosis in the adult. *Clinical Orthopaedics and Related*', (134), 212-217, available: https://pubmed.ncbi.nlm.nih.gov/729247/ [accessed 26 Oct 2020].

Horne, J.P., Flannery, R. and Usman, S. (2014) 'Adolescent Idiopathic Scoliosis: diagnosis and management", *American Family Physician,* 89(3), 193-198, available: https://www.aafp.org/afp/2014/0201/p193.html [accessed 26 Oct 2020].

Konieczny, M.R., Senyurt, H. and Krauspe, R. (2013) 'Epidemiology of adolescent idiopathic Scoliosis,' *Journal of Children's Orthopaedics*, 7 (11), 3-9, available: DOI: 10.1007/s11832-012-0457-4

Labelle, H., Richards, S.B., De Kleuver, M., Grivas, T.B., Luk, K.D., Wong, H.K., Thometz, J., Beauséjour, M., Turgeon, I. and Fong, D, Y. (2013) 'Screening for adolescent idiopathic Scoliosis: an

information statement by the scoliosis research society international task force,' *Scoliosis*, 8(17), 1-6, available: DOI: 10.1186/1748-7161-8-17.

Lonstein, J,E. (1994) 'Adolescent idiopathic Scoliosis', *Lancet*, 344(8934), 1407-1412, available: doi: 10.1016/s0140-6736(94)90572-x.

Nachemson, A. *(1979) '*Adult scoliosis, and back pain,' *Spine (Phila Pa 1976), 4(6), 513-517,* available: DOI: 10.1097/00007632-197911000-00011.

Neinstein, L.S., and Chorley, JN. (2002) 'Scoliosis and kyphosis,' *adolescent health care: a practical guide*, 4th ed. Philadelphia: Lippincott Williams & Wilkins.

Parent, E.C., Hill, D., Mahood, J., Moreau, M., Raso, J. and Lou, E. (2009) 'Discriminative and predictive validity of the scoliosis research society-22 questionnaire in management and curve-severity subgroups of adolescents with idiopathic scoliosis', *Spine (Phila Pa 1976)*; 34(22), 2450-2457, available: DOI: 10.1097/BRS.0b013e3181af28bf.

Penha, P.J., Carvalho, B.K.G., Andrade, R.M., Penha, N.L.J., and S.M.A. Joao. 'School scoliosis screening in São Paulo cities, Brazil,' *Physiotherapy*, 102(1), e114-e115, available: DOI: 10.1016/j.physio.2016.10.125.

Physiopedia (2020) *Adam's forward bend test*, available: https://www.physio-pedia.com/Adam%27s_forward_bend_test [accessed 26 Oct 2020].

Reamy, B.V. and Slakey, J.B. (2001) 'Adolescent idiopathic scoliosis: review and current concepts,' *American Family Physician*, 64(1), 111-116. available: https://pubmed.ncbi.nlm.nih.gov/11456428/ [accessed 26 Oct 2020].

Richards, B.S., and Vitale, M.G. (2008) 'Statement: Screening for Idiopathic Scoliosis in adolescents: an information statement', *The Journal of Bone and Joint Surgery*, 90(1), 195-198, available: doi: 10.2106/JBJS.G.01276.

Weinstein, S.L., Dolan, L.A., Wright, J.G. and Dobbs, M.B. (2013) 'Effects of bracing in adolescents with idiopathic scoliosis', *The New England Journal of Medicine*, 369(16), 1512-1521, available: doi: 10.1056/NEJMoa1307337.

Wong, H.K. and Tan, K.J. (2010) 'The natural history of adolescent idiopathic scoliosis', *Indian Journal of Orthopaedics*, *44*(1), 9-13, available: doi: 10.4103/0019-5413.58601.

Yamamoto, S., Shigematsu, H., Kadono, F., Tanaka, Y., Tatematsu, M., Okuda, A., Iwata, E., Koizumi M. and Tanaka, Y. (2015) 'Adolescent scoliosis screening in nara city schools: a 23-year retrospective cross-sectional study', *Asian Spine Journal*, 9(3), 407-515, available: doi: 10.4184/asj.2015.9.3.407.

Zhang, J., He, D., Gao, J., Yu, X., Sun, H., Chen, Z., Li, M. (2011) 'Changes in life satisfaction and self-esteem in patients with adolescent idiopathic Scoliosis with and without surgical intervention', *Spine (Phila Pa 1976)*, 36(9), 741-745, available: doi: 10.1097/BRS.0b013e3181e0f034.

https://www.gov.uk/government/publications/uk-national-screening-committee-recommendations-annual-report