SIPS 2017

SURABAYA INTERNATIONAL PHYSIOLOGY SEMINAR

PROCEEDINGS OF THE SURABAYA INTERNATIONAL PHYSIOLOGY SEMINAR

Surabaya, October 12-14, 2017

Editors:

Soetjipto
Muhammad Miftahussurur
Ferry Efendi
Purwo Sri Rejeki
Bambang Purwanto

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Surabaya International Physiology Seminar

Surabaya - Indonesia

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Edited by Soetjipto, Muhammad Miftahussurrur, Ferry Efendi, Purwo Sri Rejeki and Bambang Purwanto

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http://sipsfk.conference.unair.ac.id
sipsiaifi2017@gmail.com

BRIEF CONTENTS

INVITED SPEAKERS

Cheng Hwee Ming
University of Malaya
Malaysia

Daniel John Green
University of Western Australia
Australia

Fadzil Hamzah
Sport Center of Changi General Hospital
Singapore

Deanne Helena Skelly
Griffith University
Australia

ORGANIZING COMMITTEES

SCIENTIFIC COMMITTEE

Cheng Hwee Ming, Department of Physiology, Faculty of Medicine, University of Malaya, Malaysia
Daniel John Green, University of Western Australia, Australia
Fadzil Hamzah, Changi Sports Medicine Centre, Changi General Hospital, Singapore
Deanne Helena Skelly, University of Western Australia, Australia
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FOREWORD

Dean of Faculty of Medicine, Universitas Airlangga

Assalamu'alaikum Wr. Wb.

Distinguished Guests, all the Participants, Ladies and Gentlemen

On behalf of Faculty of Medicine, Universitas Airlangga, it is my great pleasure to welcome all the speakers, moderators, and participants on **Surabaya International Physiology Seminar 2017 (SIPS 2017)**, which will be held from today, October 12th until October 14th, 2017. I would like to express my hearty welcome to all the international speakers, **Prof. Cheng Hwee Ming**, from University of Malaya, Malaysia; **Prof. Daniel John Green**, from University of Western Australia; **Dr. Fadzil Hamzah**, from Sport Center of Changi General Hospital, Singapore and **Dr. Deanne Helena Skelly**, from Griffith University, Australia.

The aim of SIPS 2017 is to provide a platform for academicians, educators, researchers, practitioners, undergraduate and postgraduate students to share and discuss the knowledge of the recent issues, opinions, researchers about the development and innovation of physiology in medical science, dentistry, veterinary, plants and agriculture, sports and sciences.

I believe this event is a great purpose in order to develop knowledge, experiences and best practices that can be applied for the good, especially in the field of healthcare as a whole.

Finally, I would like to express my sincere acknowledgements to those who take part and especially for Department of Medical Physiology, Faculty of Medicine, Universitas Airlangga for their effort in holding this event and wishing all to have success.

Wassalamu'alaikum Wr. Wb.

Prof. Dr. Soetojo, MD.
Faculty of Medicine, Universitas Airlangga

Chair of Committee / Head of Physiology Department, Faculty of Medicine, Universitas Airlangga

Assalamu ‘alaikum Wr. Wb

Greetings,

On behalf of SIPS committee and Physiology Department, Universitas Airlangga, we are welcoming to Surabaya, City of Heroes.

This year, the annual meeting of Indonesian Physiology Society (IAIFI) is hosted at Surabaya, entitled **“Surabaya International Physiology Seminar Workshop (SIPS)”**. We present some update workshop and lectures in order to bring physiology research from basic to clinical application on humanities, animal welfare and good environment. All participants have opportunities to publish their research in presentation, poster and ISBN proceeding. Selected papers will be submitted to SCOPUS indexed proceeding/ journal and awarded as Best Poster and Best Oral Presentation.

We hope that all participants will get some interesting experiences for next 3 days, 12-14 October 2017. Enjoy our lectures and workshops, taste the culinary and take your time to sightseeing around Surabaya.

Wassalamu ‘alaikum wr. wb.

Dr. Bambang Purwanto
Chairman of Committee / Head of Physiology Department
Faculty of Medicine, Universitas Airlangga

Welcome Address - Surabaya International Physiology Seminar Workshop (SIPS)

Dear fellow Physiologists and Participants,

On Behalf of the Indonesian Physiological Society (IAIFI) and the Physiology Department Faculty of Medicine Universitas Airlangga, I would like to welcome you all to Surabaya International Physiology Seminar (SIPS), held on 12-14 of October 2017.

Finally after long-awaited Surabaya gets a turn again to host and organize the International Physiology Seminar. Hence the Steering– and Organizing Committee consisting of young energic physiologists are determined to make the Seminar a successful one. The theme of the seminar is:

"The Role of Physiology in Translation Research: From Basic to Application"

This annual meeting covers a wide range of topics of Physiology on Medicine, Dentistry, Veterinary, Plants and Agriculture, Sports and Sciences. We sincerely hope that SIPS 2017 enable to provide a platform for academicians, educators, researchers, practitioners and postgraduate students to present and discuss researches, development and innovations in wide range of topics as mentioned above. It will provide all participants to share knowledge, exchange new ideas and their experiences in many research topics, for then it will enhance future collaborations.

With great interest and enthusiasm I look towards the success of this Seminar, and wish all of you every success and a pleasant stay in Surabaya.

May Allah Swt. bestow upon us His Blessings.

On Behalf of the Steering and Organizing Committee Senior Physiologist,
Prof. R. Soedarso Djojonegoro

CONTENTS

PAPERS

FULL PAPERS

Does Sequential Diabetes Dance Improve on Glucose Level and Glucose Tolerance?

Cynthia Wahyu Asrizal[1,3] and Bambang Purwanto[2]
[1] *Master's Student in Basic Medical Science of Physiology*
[2]*Department of Physiology, Faculty of Medicine, Airlangga University, Campus A Jl. Mayjen Prof. Moestopo 47, Surabaya, Indonesia*
[3]*Department of Physiology, Faculty of Medicine, Syiah Kuala University, Jl. Tgk Tanooh Abee, Banda Aceh, Indonesia*
bpaifo@gmail.com

Keywords: Diabetes, Diabetes Dance, Eccentric, Glucose Level, GLUT.

Abstract: Repeated exercise can improve uptake of glucose, glucose tolerance, and insulin sensitivity in muscles more than a single bout. The eccentric contraction can also improve glucose tolerance by increasing GLUT 4 as well as insulin-stimulated muscle glucose uptake after exercise.This study aimed to investigate whether the sequential diabetes dance can improve glucose tolerance and postprandial glucose levels. We performed the diabetes dance three times a week with female non-diabetic or healthy subjects. Before and after performing the diabetes dance, we analyzed the fasting glucose level and postprandial glucose level. The postprandial glucose level, but not the fasting glucose level, was significantly lower after the sequential (three times a week) diabetes dance performances (p=0.039). Sequential diabetes dance improved postprandial glucose levels and glucose tolerance.

1 INTRODUCTION

Hyperglycemia is a glucose metabolism disorder in peripheral tissues such as the skeletal muscle, adipose and liver. It was resulted from low level of insulin secretion and response to stimulate glucose uptake (Guyton *et al.*, 2014; Perkeni, 2015; ADA, 2017). This condition is caused by genetic and lifestyle disorders such as lack of physical activity, poor eating habits, and obesity, which creates insulin resistance (Hamilton, Hamilton and Zderic, 2015; Perkeni, 2015; ADA, 2017). A meta-analysis stated that sedentary people had an 112% increased risk of impaired glucose metabolism and type 2 diabetes mellitus (Wilmot et al., 2012).

The current exercise studies and guidelines recommend that aerobic-type exercise at moderate and/or vigorous-intensity exercise is undertaken three to five days per week corresponding to 50–70% of maximal heart frequency. This is one of the important methods to improve uptake of glucose and glucose tolerance, and as a prevention and treatment of type 2 diabetes mellitus (Colberg et al., 2010; Perkeni, 2015; Röhling *et al.*, 2016; ADA, 2017). Previous studies have suggested that eccentric exercise also improve glucose levels. Eccentric exercise increases basal glucose levels acutely, due to the synthesis of glucose transporters. The glucose transporters stimulates glucose uptake after exercise (Purwanto *et al.*, 2013).

The current literature also states that repeated exercise can improve the glucose metabolism more than a single bout because of a dose-response relationship. Repeated exercise regulates more in metabolic improvements like insulin sensitivity, transcription and expression of GLUT4 (Lehnen, 2012; Richter and Hargreaves, 2013; Röhling *et al.*, 2016).

The diabetes dance is a dance that uses a combination of aerobic exercise and eccentric movements that are expected to improve uptake of glucose and glucose tolerance. The sequential diabetes dance was considered to be able to prevent glucose level impairment on pre diabetic subject. This experiment aimed to ascertain if the repeated diabetes dance would improve glucose tolerance and postprandial glucose levels.

Wahyu Asrizal, C. and Purwanto, B.
Does Sequential Diabetes Dance Improve on Glucose Level and Glucose Tolerance?.
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2 METHODS

2.1 Study Participants

Nine female non-diabetic or healthy subjects, graduate students of the medical faculty of Airlangga University, were recruited to participate in this study. The subjects had to meet the criteria: female, healthy, sedentary (fewer than 2.0 hours of physical exercise per week), non-smoker, no history of acute or chronic diseases that would complicate a good performance. The exclusion criteria were: subject with diabetes mellitus type 2 or diabetes mellitus type 1. Informed consent was provided by every participant. Characteristics of the study participants are shown in Table 1.

Table 1: Characteristics of study participants (N=9).

Characteristic	Mean ± SD
Age (years)	25.78±3.3
Height (m)	1.58±3.24
Body mass (kg)	56.2±9.9
BMI (kg m−2)	22.4±4.
Energy expenditure (kkal)	98.56±33.03
% of max HR (%)	63.9±7.11

2.2 Study Protocol

This study was designed with experimental pre and post test models. The experiment was completed within eight days. All participants underwent a fasting glucose level and postprandial glucose level beforehand (day 1) and again after the diabetes dance intervention (day 8). The subject performed the diabetes dance three times a week, on the first day, the third day and the fifth day in one week. Post test was measured 72 hours after the last bout of exercise. An outline of the experimental time schedule appears in Figure 1.

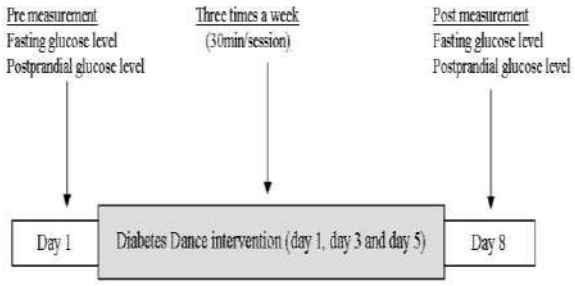

Figure 1: Study overview of the experiment prior to and after the diabetes dance intervention.

2.3 Diabetes Dance Intervention

Participants performed diabetes dance for 30 minutes per session three times a week, on Monday, Wednesday and Friday. They followed the dance movement from the video after previously being given an explanation about the movement. Each participant must complete all sessions.

2.4 Measurement of Glucose Level

A fasting glucose level and postprandial glucose level was measured and analyzed using an Easy Touch glucose check unit (MHC Medical Products, LLC, Taiwan). The participants attended for pre-measurement on the first day after a minimum 8-hour overnight fast. After we measured the fasting glucose level, participants had to eat 350 kkal of food. Participants waited 2 hours for the next examination, and participants were not allowed to eat anything in that time. Two hours after ingestion we measured again the postprandial glucose level. The same measurement procedure was repeated again after the diabetes dance intervention on the eighth day.

2.5 Measurement of Energy Expenditure

Energy expenditure was measured using Actiheart. Actiheart is a device that was attached to the chest wall while the participants performed the diabetes dance. Afterwards the results were read on the available application.

3 RESULT

Following the three-times-a-week diabetes dance, the postprandial glucose level had significantly changed ($p=0.039$). The fasting glucose level did not significantly change ($p=0.615$) as a result of the intervention. However, there is potential for improvement because the mean of the level of fasting glucose decreased after the intervention from 86.11 ± 7.46 into 84.56±7.7. The results of this study are shown in Table 2, Figure 2.

Table 2: The comparison of fasting glucose level and postprandial glucose level pre and post diabetes dance intervention.

Glucose level	Pre (mg/dl)	Post (mg/dl)	Paired T-test P
Fasting	86.11 ± 7.46	84.56±7.7	0.615
Post prandial	104.2±11.5	97.3±13.9	0.039*

*p <0.05 indicating significant difference in postprandial glucose level between pre and post intervention

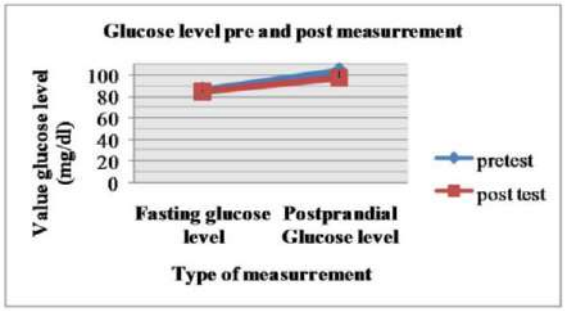

Figure 2: The graphic of fasting glucose level and postprandial glucose level pre and post measurement. There is a decrease in the extent of the graphs on post-measurement after intervention.

4 DISCUSSION

The main finding of this study was, the improvent of postprandial glucose level after diabetes dance sequencial performance. Our result supported previous finding that repeated exercise significantly increase on insulin sensitivity between 48 to 72 hours after exercise (Way *et al.*, 2016).

There are different mechanisms of insulin mediated-glucose uptake levels, as the chronic effects of exercise. Improvement on blood flow expands the delivery area of glucose and insulin, change in GLUT4 transcription factors, resulting in an increase in intracellular GLUT4 stores, and change in protein endocytosis and exocytosis. Exercise also improves insulin action, with increased expression and activity of the insulin-signaling protein kinase (Lehnen, 2012).

Previous studies stated that contraction of the muscle results in greater TBC1D1 phosphorylation, which is likely to be secondary to increased AMP-activated protein kinase (AMPK) activity and potentially important for contraction-stimulated glucose uptake and insulin-stimulated glucose uptake (Richter and Hargreaves, 2013; Cartee, 2015). GLUT4 expression is regulated through AMPK and CaMKII pathway with HDAC4/5-MEF2 axis and MEF2-GEF interactions resulting in histone hyperacetylation on the GLUT4 promoter and increased GLUT4 transcription resulting in more intracellular GLUT4 stores (Richter and Hargreaves, 2013).

Second, fasting glucose levels did not change significantly after the intervention. Our findings were consistent with Purwanto's study (Purwanto *et al.*, 2013); the fasting glucose level raised again on the third day. The eccentric movement of the diabetes dance activates p38MAPK and GLUT1 expression to improves basal glucose uptake. The improvement of GLUT1 reduces insulin dependence, and improves glucose uptake with GLUT4 (Purwanto *et al.*, 2013).

In this study, the fasting glucose level pre and post is 86.11 ± 7.46 and 84.56±7.7. There are various compensation mechanisms to maintain blood glucose levels within normal range conditions so it does not become hypoglycemic, such as halting insulin secretion if the blood glucose level reaches 80mg/dl, starting the secretion of the glucagon hormone, epinephrine, growth hormone, and cortisol when blood glucose levels reach 70 mg/dl to increase gluconeogenesis (Guyton *et al.*, 2014; Barrett *et al.*, 2016).

5 CONCLUSIONS

The diabetes dance significantly improves glucose tolerance and insulin-stimulated glucose uptake, but not basal glucose uptake. These findings also demonstrate that the diabetes dance is a beneficial exercise strategy in prevention and treatment of T2D patients. The diabetes dance should be done regularly to prevent insulin resistance.

REFERENCES

ADA (2017), *The Journal OF ClINICAL AND APPLIED RESEARCH AND EDUATION*, 40(American diabetes Association Standars of Medial care In Diabetes-2017).

Barrett, K. E. et al. (2016) *Ganong's Review of Medical Physiology*.

Cartee, G. D. (2015) 'Roles of TBC1D1 and TBC1D4 in insulin- and exercise-stimulated glucose transport of skeletal muscle', *Diabetologia*, 58(1), pp. 19–30. doi: 10.1007/s00125-014-3395-5.

Colberg, S. R. et al. (2010) 'Exercise and type 2 diabetes: The American College Of Sports Medicine and The

American Diabetes Association: Joint position statement executive summary', *Diabetes Care*, 33(12), pp. 2692–2696. doi: 10.2337/dc10-1548.

Guyton, L. et al. (2014) *Guyton and Hall Textbook of Medical Physiology*, *Igarss 2014*. doi: 10.1007/s13398-014-0173-7.2.

Hamilton, M. T., Hamilton, D. G. and Zderic, T. W. (2015) 'Sedentary behavior as a mediator of type 2 diabetes', *Med Sport Sci*, (225), pp.1126.doi:10.1159/000357332.Sedentary.

Lehnen (2012) 'Changes in the GLUT4 Expression by Acute Exercise, Exercise Training and Detraining in Experimental Models', *J Diabetes Metab*, (10). doi: 10.4172/2155-6156.S10-002.

Perkeni (2015) *Konsensus Pengelolaan dan Pencegahan Diabetes Melitus tipe 2 di Indonesia 2015*, *Pengurus Besar Perkumpulan Endokrinologi Indonesia (PB Perkeni)*.doi:10.1017/CBO9781107415324.004.

Purwanto, B. et al. (2013) 'Muscle Glucose Transporter 1 (Glut-1) Expression in Diabetic Rat Models', *FOlia Medica Indonesia*, 49, pp. 21–25.

Richter, E. a and Hargreaves, M. (2013) 'Exercise, GLUT4, and skeletal muscle glucose uptake.', *Physiological reviews*, 93(3),pp.9931017.doi:10.1152/physrev.00038.2012.

Röhling, M. et al. (2016) 'Influence of Acute and Chronic Exercise on Glucose Uptake', *Journal of Diabetes Research*. Hindawi, 2016,pp. 1–33. doi: 10.1155/2016/2868652.

Way, K. L. et al. (2016) 'The Effect of Regular Exercise on Insulin Sensitivity in Type 2 Diabetes Mellitus: A Systematic Review and Meta-Analysis.', *Diabetes & metabolism journal*. Korean Diabetes Association, 40(4), pp.253–71.doi: 10.4093/dmj.2016.40.4.253.

Wilmot, E. G. et al. (2012) 'Sedentary time in adults and the association with diabetes, cardiovascular disease and death: Systematic review and meta-analysis', *Diabetologia*, 55(11), pp. 2895–2905. doi: 10.1007/s00125-012-2677-z.