The Psychological effect of Music on Anxiety and Studying

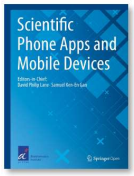
Samuel Gan,
Principal Investigator
Antibody & Product Development Lab (APD)

Established in 2013 in A*STAR (BII-p53)

- Started three new fields of research
  - Scientific Mobile Apps (Journal, Products, International news coverage)
  - Psycho-biology (high impact psych journals, media coverage)
  - Detailed Antibody Engineering
  - Viral Drug design – HIV
- Published ~50 books, papers articles, tech disclosures.
- Intern grooming (ASPIRE) : ~40 Interns from tertiary institutes
- Graduated over 20 Psych undergrad students
- Started "Made in Singapore" products
- Scientific Apps - "SMART" before "SMART Nation Initiative" – Academic + Commercial

New emerging field - Scientific Apps

- Released >20 apps since 2014 (Android & iOS)
- Bioinformatics apps
- Lab Equipment app
- Survey-based Research (Psych, Market, Clinical)
- Clinical treatment management.
- ~30,000 users worldwide
- APD SKEG Pte Ltd.



Scientific Phone Apps and Mobile Devices
Editors-in-Chief: S.D.P. Lane; S.K.-E. Gan

- First specialized journal for smartphone apps and add-on peripheral devices
- Also the first academic journal to accommodate commercial apps/ devices
- Provides an avenue for awareness of useful scientific apps/devices to the larger scientific community

The Journal ***Scientific Phone Apps and Mobile Devices*** is a peer-reviewed open access journal published under the SpringerOpen brand. The first specialized journal in this field, it publishes high quality scientific reports of research and science oriented mobile apps and peripheral mobile devices such as add-on sensors or modifications. It provides an avenue for academic recognition, and serves as a resource for the broader scientific community to learn about the development of such research tools. The journal accepts full research articles, application notes, reviews, editorials, and correspondences related to the development of research or educational apps in all disciplines. It also includes add-on peripherals (such as additional sensors or connectivity) related to mobile devices, and modifications.

Electronic access

The apps or mobile add-on devices should aim at replacing bulky equipment or to enable certain features on smartphones, phablets or tablets. The focus would be on the functionality and convenience.

Giving authors in their area of expertise the opportunity to publish open access

- High visibility thanks to unrestricted online access
- Rigorous peer-review and high-quality author services
- Creative Commons licensed – authors retain copyright
- Citation tracking and inclusion in bibliographic databases
- Easy compliance with open access mandates

Gan and Goh *Scientific Phone Apps and Mobile Devices* (2016) 2:1
DOI 10.1186/s41070-016-0005-6

Scientific Phone Apps and Mobile Devices
a SpringerOpen Journal

EDITORIAL Open Access

Editorial: A dearth of apps for psychology: the mind, the phone, and the battery

Samuel Ken-En Gan[1,2,3]* and Benjamin Yi-Liang Goh[1,3]

"Oedipus complex", "penis-envy", "oral fixation", and "interpreting dreams". From the peering into the unconscious mind in the days of Sigmund Freud (Freud, 1940) to the deep questions of evil (Haney, Banks, Jaffe & Zimbardo., 1972; Milgram 1978), the field of Psychology has been enigmatic since its birth. Despite having clear useful applications (e.g. lie-detection, people management, etc.), the field is still regarded by many to be an 'art' rather than 'science'. While psychology often relied on qualitative observation (Denzin & Lincoln, 2009), the by virtue of their immobility. The convenience is also further limited by the lack of suitable places for long interviews and psychological batteries (long psychology surveys with hundreds of items).

Fortunately, despite all these disadvantages, one modern invention holds the potential to revolutionize these practices – The Smartphone.

Two decades ago, the first smartphone by IBM captured everyone's attention with its ability to incorporate the multiple functions into one small brick-like device.

Psych Apps

- High accuracy of data collected in certain sub-disciplines such as cognitive neuropsychology for cognitive speed and response time direct measurements.
- Analysis and collection of data are increasingly performed by software that are more convenient and give more accurate measurements.
- Can also be used in qualitative research e.g. speech-to-text software for transcription of qualitative interviews, and video analysis software for body languages.
- Possible to leverage on sensors (either in-built into smartphones or peripherally attached). iStethoscope in Apple App Store for anxiety studies.
- Data can be collected from across the globe easily and cost effectively, making psychological findings more relevant to a wider general audience.
- With larger sample sizes that are more diverse, psychological studies may be more reproducible, a problem recently highlighted (Open Science Collaboration, 2015).

Nguyen et al. Scientific Phone Apps and Mobile Devices (2015) 1:3
DOI 10.1186/s41070-015-0002-1

Scientific Phone Apps and Mobile Devices
a SpringerOpen Journal

APPLICATION NOTE — Open Access

PsychVeyApp: Research survey app

Phi-Vu Nguyen[1†], Jeremy Poon-Heng Lim[2†], Ian-Hartono Budianto[1] and Samuel Ken-En Gan[1,2,3*]

Abstract

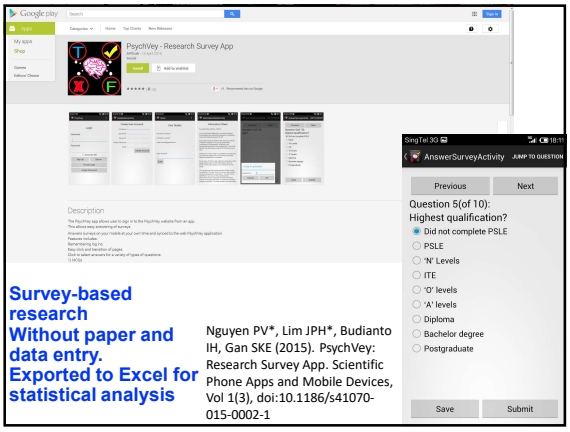
Surveys are used extensively to gather information from clinical, market, and psychological research studies. However, this process is time-consuming and error-prone especially with the tedious data entry. Psychvey is a web and mobile application that allows the easy design, creation, analysis, and taking part in surveys electronically. Collected data are easily exported into spreadsheets for subsequent statistical analysis, displacing the physical collection of survey responses and manual data entry. This allows for added confidential security and prevents data entry errors while maximising participants' convenience. Psychvey facilitates data collection from simple surveys to long multi-typed studies and aids studies and data collection, thus catering to a whole range of purposes.

Introduction

Surveys are used in multiple disciplines ranging from opinion polls, market research and academic studies in clinical research and psychology (see our examples: [1–3]). Academic studies, in particularly, can be lengthy and encompass hundreds of questions that can take hours to answer. Long surveys are time-consuming and tedious to compile, making it error prone during data entry. To address this problem, the widespread use of smartphones and mobile devices offers a potential solution. Mobile apps are the next frontier tools for scientific research [4], with the potential to displace laboratory equipment and facilitate "on-the-go" analysis (see www.biospectrumasia.com/bios-

involves the design of surveys, where users create surveys in the web application. Answering a survey is via the web or the Android app. The logic tier supports the analysis, management, administration, and the remote connection between the mobile application and the database (RESTful web service). This web service is linked to the data storage tier using Microsoft SQL Server.

The Psychvey web application was created using the Microsoft .NET framework (C# programming language), while the web service and the Android application were developed in Java using Eclipse IDE (https://www.eclipse.org/downloads/).

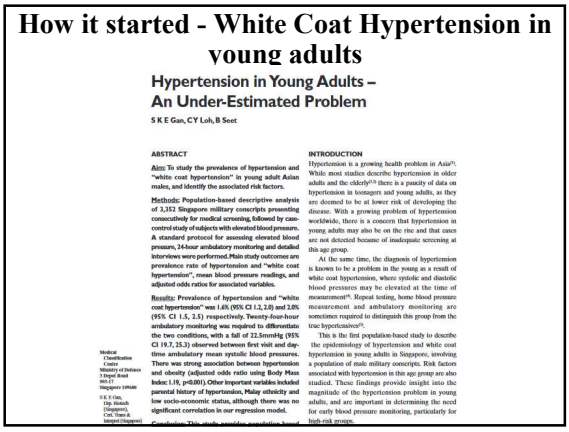


Survey-based research
Without paper and data entry.
Exported to Excel for statistical analysis

Nguyen PV*, Lim JPH*, Budianto IH, Gan SKE (2015). PsychVey: Research Survey App. Scientific Phone Apps and Mobile Devices, Vol 1(3), doi:10.1186/s41070-015-0002-1

Psychobiology/Sociology

How it started - White Coat Hypertension in young adults



Hypertension in Young Adults – An Under-Estimated Problem

S K E Gan, C Y Loh, B Seet

ABSTRACT

Aim: To study the prevalence of hypertension and "white coat hypertension" in young adult Asian males, and identify the associated risk factors.

Methods: Population-based descriptive analysis of 3,352 Singapore military conscripts presenting consecutively for medical screening, followed by case-control study of subjects with elevated blood pressure. A standard protocol for assessing elevated blood pressure, 24-hour ambulatory monitoring and detailed interviews were performed. Main study outcomes are prevalence rate of hypertension and "white coat hypertension", mean blood pressure readings, and adjusted odds ratios for associated variables.

Results: Prevalence of hypertension and "white coat hypertension" was 1.6% (95% CI 1.2, 1.9) and 2.0% (95% CI 1.5, 2.5) respectively. Twenty-four-hour ambulatory monitoring was required to differentiate the two conditions, with a fall of 22.5mmHg (95% CI 19.7, 25.3) observed between first visit and daytime ambulatory mean systolic blood pressures. There was strong association between hypertension and obesity (adjusted odds ratio using Body Mass Index: 1.10, p<0.001). Other important variables included parental history of hypertension, Malay ethnicity and low socio-economic status, although there was no significant correlation in our regression model.

INTRODUCTION

Hypertension is a growing health problem in Asia[1]. While most studies describe hypertension in older adults and the elderly[2,3] there is a paucity of data on hypertension in teenagers and young adults, as they are deemed to be at lower risk of developing the disease. With a growing problem of hypertension worldwide, there is a concern that hypertension in young adults may also be on the rise and that cases are not detected because of inadequate screening at this age group.

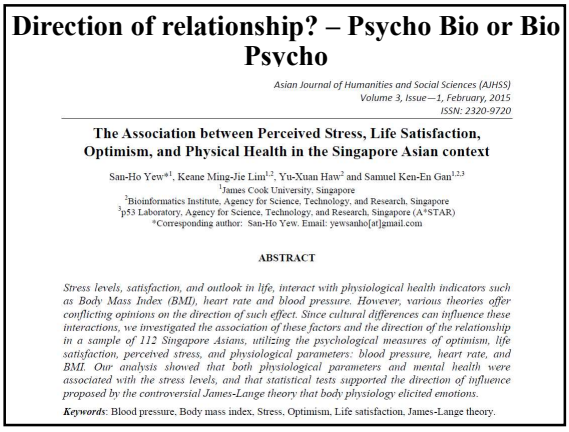
At the same time, the diagnosis of hypertension is known to be a problem in the young as a result of white coat hypertension, where systolic and diastolic blood pressures may be elevated at the time of measurement[4]. Repeat testing, home blood pressure measurement and ambulatory monitoring are sometimes required to distinguish this group from the true hypertensives[5].

This is the first population-based study to describe the epidemiology of hypertension and white coat hypertension in young adults in Singapore, involving a population of male military conscripts. Risk factors associated with hypertension in this age group are also studied. These findings provide insight into the magnitude of the hypertension problem in young adults, and are important in determining the need for early blood pressure monitoring, particularly for high-risk groups.

The beginning - White Coat Hypertension in young adults

- 3352 Singapore military conscripts (18-23 yrs old)
- Fall of 22.5mmHg between 1st day and day time ABP systolic pressure.
- Automated BP machine
- Manual BP
- Ambulatory BP machine.
- Demographic questionnaire
- True and white coat was 1.6% and 2.0% using ABP to differentiate.
- Strong association between hypertension and obesity.
- Other variables included family history, malay ethnicity and low socio-economic status.
- No significant correlation in regression model.
- Link between psychological factors to physiological?

Direction of relationship? – Psycho Bio or Bio Psycho



Asian Journal of Humanities and Social Sciences (AJHSS)
Volume 3, Issue—1, February, 2015
ISSN: 2320-9720

The Association between Perceived Stress, Life Satisfaction, Optimism, and Physical Health in the Singapore Asian context

San-Ho Yew*[1], Keane Ming-Jie Lim[1,2], Yu-Xuan Haw[2] and Samuel Ken-En Gan[1,2,3]
[1]James Cook University, Singapore
[2]Bioinformatics Institute, Agency for Science, Technology, and Research, Singapore
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ABSTRACT

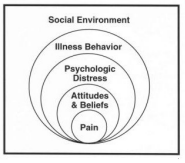
Stress levels, satisfaction, and outlook in life, interact with physiological health indicators such as Body Mass Index (BMI), heart rate and blood pressure. However, various theories offer conflicting opinions on the direction of such effect. Since cultural differences can influence these interactions, we investigated the association of these factors and the direction of the relationship in a sample of 112 Singapore Asians, utilizing the psychological measures of optimism, life satisfaction, perceived stress, and physiological parameters: blood pressure, heart rate, and BMI. Our analysis showed that both physiological parameters and mental health were associated with the stress levels, and that statistical tests supported the direction of influence proposed by the controversial James-Lange theory that body physiology elicited emotions.

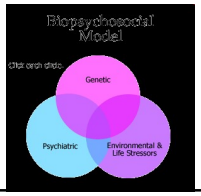
Keywords: Blood pressure, Body mass index, Stress, Optimism, Life satisfaction, James-Lange theory.

Direction of relationship – Psycho Bio or Bio Psycho

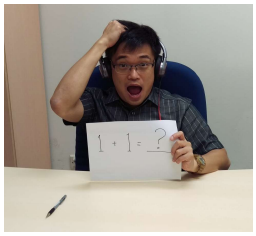
- 112 Singaporeans
- Optimism
- Life Satisfaction
- Perceived stress
- Blood pressure + HR
- BMI
- Statistical analysis showed that BP, HR and mental health to be associated with stress levels.
- Statistical analysis suggested psychological measures to affect physiology

Key models - Biopsychosocial

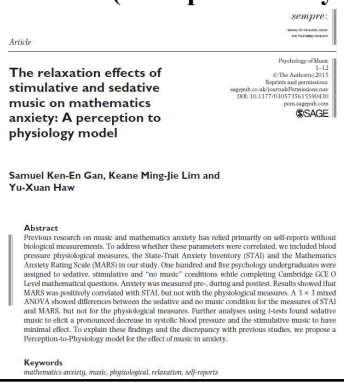




Music and Anxiety (Math Anxiety)



New P2P model (Perception to Physiology)



sempre:

Article

The relaxation effects of stimulative and sedative music on mathematics anxiety: A perception to physiology model

Psychology of Music
1–12
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DOI: 10.1177/0305735615590430
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Samuel Ken-En Gan, Keane Ming-Jie Lim and Yu-Xuan Haw

Abstract

Previous research on music and mathematics anxiety has relied primarily on self-reports without biological measurements. To address whether these parameters were correlated, we included blood pressure physiological measures, the State-Trait Anxiety Inventory (STAI) and the Mathematics Anxiety Rating Scale (MARS) in our study. One hundred and five psychology undergraduates were assigned to sedative, stimulative and "no music" conditions while completing Cambridge GCE O Level mathematical questions. Anxiety was measured pre-, during and posttest. Results showed that MARS was positively correlated with STAI, but not with the physiological measures. A 3 × 3 mixed ANOVA showed differences between the sedative and no music condition for the measures of STAI and MARS, but not for the physiological measures. Further analyses using *t*-tests found sedative music to elicit a pronounced decrease in systolic blood pressure and the stimulative music to have minimal effect. To explain these findings and the discrepancy with previous studies, we propose a Perception-to-Physiology model for the effect of music in anxiety.

Keywords

mathematics anxiety, music, physiological, relaxation, self-reports

New P2P model (Perception to Physiology)

- 105 Psychology undergrads
- State-Trait Anxiety Inventory (STAI)
- Mathematics Anxiety Rating Scale (MARS)
- Sedative, Stimulative and 'no music'
- Blood pressure + HR (pre-, during, post)
- GCE O Level Maths questions (timed)

- Statistical analysis re-affirmed that BP, HR and mental health to be associated with stress levels.
- Proposed model that calming music requires at least 30 min to have physiological effect.

New P2P model (Perception to Physiology)

- Psychology Today article on World's First Music Therapist - https://www.psychologytoday.com/blog/the-power-music/201704/the-world-s-first-music-therapist

- 1 Samuel 16:23 - And it came to pass, when the *evil* spirit from God was upon Saul, that David took an harp, and played with his hand: so Saul was refreshed, and was well, and the evil spirit departed from him.

Music and learning – Should you listen to music while studying?

Music and learning

sempre:
Society for Education, Music and Psychology Research

Article

Psychology of Music
1–6
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DOI: 10.1177/0305735616636209
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The effects of familiarity and language of background music on working memory and language tasks in Singapore

Agnes Si-Qi Chew[1], Ya-Ting Yu[1], Si-Wei Chua[1] and Samuel Ken-En Gan[2]

Abstract

The effect of background music on learning and academic performance is highly relevant to the everyday lives of millions of students worldwide. To investigate this, we recruited 165 undergraduate students (71 males and 94 females, mean age of 21.87 years) to complete arithmetic, reading comprehension, and word memory tasks while exposed to familiar or unfamiliar, foreign or first language music, and no music. With the task scores as dependent variables, a significant main effect was observed for music familiarity but not for language. Further analysis showed that only the word memory task was affected by music with significantly higher scores in the familiar than unfamiliar music conditions. Despite a slight negative trend, no significant effect was found in the interaction between music and language conditions. Depending on the task, familiarity but not language of music affected learning and task performance when compared to no music condition.

Music and learning

- Impact of education/work sectors.
- 165 Psychology undergrads
- Arithmetic, reading comprehension, word memory tasks
- Familiar/unfamiliar, foreign/1st language music, no music.
- Music familiarity found to help word memory tasks.
- Slight negative trend but no interaction between music and language conditions.
- Language had no effect on learning and task performance compared to no music.
- Implication on music in labs/during study and tasks.

Coming soon…

- Effect of background music on customer behaviour in a restaurant.

Drilling into the immunobiology of psychology– Psycho-oto-rhino-microbiology

- Microbiota and well-being are associated.
- Germ free mice had exaggerated stress hormone production.
- Usual method is by microbiota diversity.
- Believed to be due to chemical released by microbiota or vagus nerve mediated (gut microbiota).
- Hygiene hypothesis?
- Studies typically use fecal or gut swabs (anaerobic).
- 106 healthy individuals studied.
- Perceived stress, general well-being, and happiness/depression.
- Microbial swap from less invasive ENT areas.
- Oral microbial highly diverse (anaerobic)
- Perceived stress and well-being associated with lower otorhino microbial counts but not happiness.
- Women have less microbiota, lower well-being and higher stress.
- No effect of age, religion and ethnicity.

The Group

Special thanks to:

Sir David Lane
Prof Frank Eisenhaber
Prof Chandra Verma

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