



chirosacademy

RESEARCH METHODS LEVEL 1

11 How many participants you need for your study

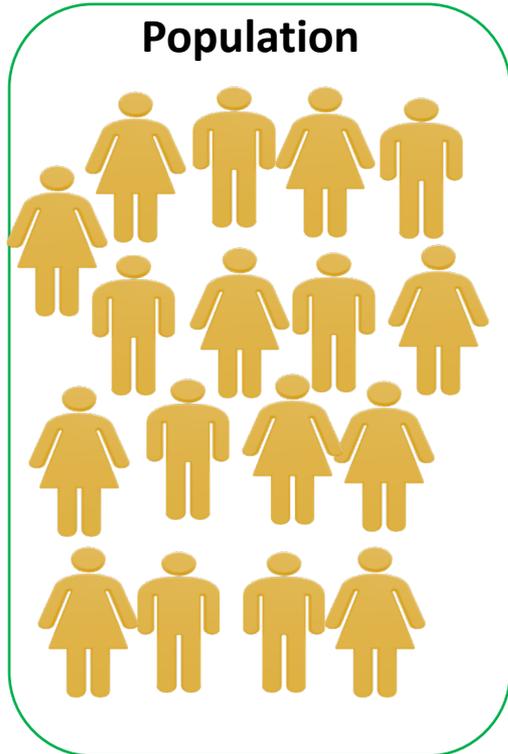
Class Outline

- What is sample size and why do we calculate it?
 - Defining population and sample with examples
 - Importance of sample size calculation
- Sample size, sampling error and types of sample size calculations
- Power-based sample size calculations
 - Hypotheses with Type 1 and Type 2 errors
- Formula and software-based sample size calculations
 - Sample size and power calculation using G*Power software
- Summary

Important references to support power point

- Dattalo, P. (2008). *Determining sample size : balancing power, precision, and practicality*. Oxford University Press. <https://oxford.universitypressscholarship.com/view/10.1093/acprof:oso/9780195315493.001.0001/acprof-9780195315493>
- Ryan, T. P. (2013). *Sample size determination and power*. John Wiley & Sons. <https://www.wiley.com/en-us/Sample+Size+Determination+and+Power-p-9781118437605>
- *Learning Statistics*. (2017). San Francisco, California, USA, The Great Courses. <https://aut.kanopy.com/node/5733177>
- *Sample size calculations in clinical research*. (2017). (S.-C. Chow, Ed. Third edition. ed.). CRC Press. <http://ebookcentral.proquest.com/lib/AUT/detail.action?docID=4947508>
- Postles, Ali, Heidi Haavik Taylor, and Kelly Holt. "Changes in asthma symptoms and bedwetting in a four year old child receiving chiropractic care: a case report." *Chiropractic Journal of Australia* 40.1 (2010): 34-36.
- Lelic D, Niazi IK, Holt K, Jochumsen M, Dremstrup K, Yelder P, Murphy B, Drewes AM, Haavik H. Manipulation of dysfunctional spinal joints affects sensorimotor integration in the prefrontal cortex: a brain source localization study. *Neural plasticity*. 2016 Oct;2016.
- Holt KR, Haavik H, Lee AC, Murphy B, Elley CR. Effectiveness of chiropractic care to improve sensorimotor function associated with falls risk in older people: a randomized controlled trial. *Journal of manipulative and physiological therapeutics*. 2016 May 1;39(4):267-78.

Defining Population

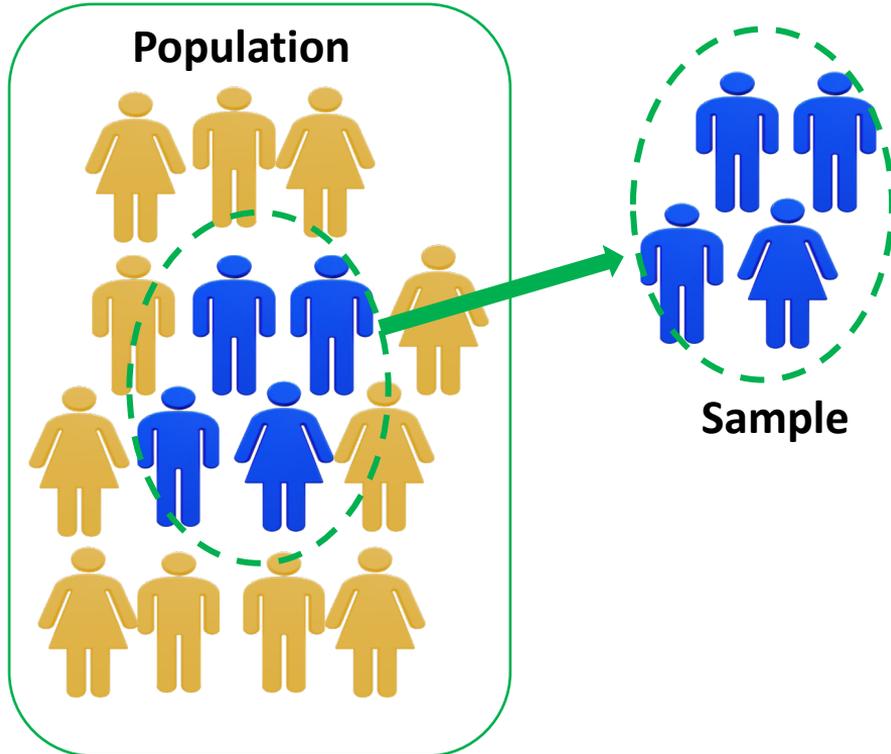


A **population** is the entire group you want to look at and draw conclusions about

- For example, you want to look at the data of people going for chiropractic adjustment in New Zealand.
- Or you want chiropractors in New Zealand to fill out a survey for you.

In the first example, your population includes all the people in NZ who are going for chiropractic adjustments. Similarly in the second example, your population includes all chiropractors in NZ.

Defining Sample



A **sample** is a specific group from a population that you will collect data from.

- For example, if our population is people going for chiropractic adjustments in NZ, then our sample is people going for chiropractic adjustments at NZCC.

Population vs Sample Examples

Population	Sample
Advertisements for IT jobs in the New Zealand.	The top 50 search results for advertisements for IT jobs in the New Zealand on December 1, 2021.
Songs from the Song Contest in Auckland.	Winning songs from the Auckland Song Contest that were performed in English.
Undergraduate students in the New Zealand.	300 undergraduate students from three Auckland universities who volunteer for your chiropractic study.
All countries of the world.	Countries with lowest COVID-19 mortality rates.
Chiropractors in New Zealand	Chiropractors at NZCC

What Is Sample Size?

- **Sample size** refers to the **number of participants or observations** included in a study (How many subjects you need in your study?).
- For example, you want to look at 25 people who are attending chiropractic sessions at NZCC. So, your sample size will be 25.
- Or you want to include 25 chiropractors from NZCC in your survey.
- **Where does this sample size number 25 come from and is it important?**
- This number usually comes from previous study results, piloting work in conjunction with your study's hypothesis and outcome parameters.
- Yes, it is very important to estimate your sample size before starting your study.

Examples – Case Study – 1 Participant

Changes in Asthma Symptoms and Bedwetting in a Four Year Old Child Receiving Chiropractic Care: A Case Report

ALI POSTLES, HEIDI HAAVIK TAYLOR and KELLY HOLT

ABSTRACT: *Objective:* This article describes and discusses changes in asthma, bedwetting and allergy symptoms in a four-year-old child receiving chiropractic care. *Clinical Features:* A four-year-old child diagnosed with asthma and a history of allergies, bedwetting and disrupted sleep presented for chiropractic care. *Intervention and Outcome:* The child received spinal and cranial adjustments based on Sacro Occipital Technique (SOT) protocol. After 32 weeks of chiropractic care the child no longer had asthma symptoms, bedwetting had ceased and a positive change in other presenting symptoms was noted. *Conclusion:* There are a growing number of case reports that describe improvements in childhood problems such as asthma and nocturnal enuresis in children receiving chiropractic care. Thus far clinical trials have failed to provide sufficient evidence to support the potential link between improvements in these childhood problems and chiropractic care. Further study is required to investigate the role chiropractors may play in caring for children with these disorders.

INDEX TERMS: ASTHMA; CHIROPRACTIC; CASE REPORTS
(PUBLICATION TYPE); NOCTURNAL ENURESIS.

Chiropr J Aust 2010; 40: 34-6.



(Postles, Haavik and Holt 2010)

Examples – Whole Head EEG Study in Denmark 19 participants (two sessions)



Example: Randomized
Controlled Trial
recording at:
Baseline
After 4 weeks
After 12 weeks
60 older adults
(two groups)



(Holt et al 2016)

Why Do We Need To Calculate Sample Size?

- In a research project, we start our study with a **research question**. For example, will spinal adjustment help improve quality of life?
- In a semester, you have four months to collect data and find answers to your research question. You know that you can collect data from 50 participants in these four months.
- **Will you be able to find answer to your research question with 50 participants? Can you do it with less than 50 to save time and resources?**
- The answer to these questions comes from estimating the sample size before collecting data.

Sample Size and Research Design

- Sample sizes vary across different research designs. Therefore, to know your study design is fundamental to calculating sample sizes.
- Let us look at some mostly used research designs in chiropractic research.
- **Case studies** interprets an individual case (**sample size = 1**). For example, In a case study done by Chu & Lin in 2018, a 47-year-old man suffering from Neck–Tongue Syndrome (NTS) was successfully treated with a chiropractic approach.
- **Case control studies** compares patients who have outcome of interest (Cases) with patients who do not have the outcome (Control). For example, you want to compare the patients with neck pain at NZCC (Cases) with patients without neck pain at NZCC (Control). **Generally, 10 to 30 participants in each group are used for these case control studies (sample size)**. However, this sample size can vary based on your research question and methodology (invasive or non-invasive).

Sample Size and Research Design

- The most used **randomized control trials (RCTs)** randomly assigns participants into an experimental group or a control group. For example, you have 100 patients at NZCC with neck pain and you devise two protocols to treat them, one with technology (experimental group) and one without technology (control group).
- If you conduct an RCT, your 100 patients will be randomly allocated to experimental and control group. There can be different sessions of an RCT (depends on your research question). **The sample size for these RCTs is usually high (in hundreds).**
- Let us look at one practical example, where an RCT was conducted to assess the efficacy of chiropractic spinal manipulative therapy (SMT) in the treatment of migraine. In this study, a six-month randomized control trial was conducted with **127 participants divided into control and treatment group.**

Importance of Sample Size Calculation

- There are following advantages of sample size calculations:
 - To show that, your research question has good chances to get answered.
 - To show that the necessary resources (human, time, and money) are minimized and well utilized

What Do You Need to Know to Calculate Sample Size?

- Sample size calculation is an educated guess.
- There is no magic involved; only statistical and mathematical logic.
- You should be aware of your population, sample, research question, and output parameters.

Sample Size Estimation (how much is enough)

Too Big:

Requires too much resources
(time, human, and money).



Too Small:

Will not be able to answer
your research question.

The answer depends on:

- The precision you want.
- The power to estimate difference.
- Your hypothesis, research question and outcome measures.

Helpful Information for Sample Size Calculations

- Important information regarding our outcome measures, study design, research question can be gathered from.
- Previous studies (Literature review).
- Pilot studies.

Sampling Error

- As we stated earlier, we select a small sample from larger population to answer our research question. For example, we select 25 people undergoing chiropractic adjustment at NZCC out of hundreds.
- No matter how careful we are at selecting these 25 people there will still be a margin of error in our results.
- This is because we did not talk to all the people going to NZCC for chiropractic adjustment.
- This unavoidable margin of error is known as **sampling error**.

Types of Sampling Errors

- There can be other types of sampling errors which can be avoided.
- A **population-specific error** occurs when a researcher doesn't understand who to survey. For example, you are looking for patients at NZCC with neck pain but surveying all patients at NZCC. Researchers can minimize population-specific error with clearly defining the research question with population.
- **Selection error** occurs when only those participants who are interested in the survey respond to the questions. For example, patients happy with their chiropractic adjustment filled your survey. In this case, you will not be able to generalize your findings as your selection of patients was biased. Researchers can attempt to overcome selection error by finding ways to encourage participation.
- A **sample frame error** occurs when a wrong sample is selected from the targeted population data. For example, your population is patients at NZCC, and you want to look at patients with neck pain at NZCC, but you select patients at NZCC with pain.

Sampling Error vs Sample Size

- Sampling error can be eased by sample size.
- A large sample size means small margin of error. For example, if we want to know the exact answer to our research question, “Does spinal adjustment improves quality of life?”, we need to talk to plenty of patients at NZCC.
- But a large sample size can increase resource utilization and imagine getting data from 200 patients instead of 25.
- Then there is a point after which increasing sample size does not impact sampling error. This point is known as law of diminishing returns.
- **Therefore, it is crucial to estimate correct sample size before starting your study.**

Types of Sample Size Calculations

- There are two approaches to sample size calculations:
- **Precision-based:** With what precision do you want to estimate the outcome measures? How accurate do you want it to be? In general, a confidence interval of 95% is used.
- **Power-based:** How small a difference is important to detect and with what degree of certainty?
- For power-based calculations we need to define our hypotheses based on the research question.

Let's Start With Sample Size Calculations

- Start by looking at your research question. In our previous example we use the research question:
- **Will spinal adjustment help improve quality of life?**
- With this research question you can define two hypotheses:
 - Spinal adjustment will improve quality of life (Alternate Hypothesis, H_1)
 - Spinal adjustment has no impact on quality of life (Null Hypothesis, H_0)
- Null hypothesis is your fallback option (or, in other words, it states no affect).

Hypotheses and Errors

- We define two hypotheses, now there can be two possible conclusions:
- H_1 is correct (There is an affect)
- H_0 is correct (There is no affect)
- In light of these conclusions, there can be two types of errors:
- Type 1 error
- Type 2 error

Type 1 Errors

- It is the probability of finding a difference (or rejecting Null hypothesis) while there was no difference (Null hypothesis was true).
- For example, in our example research question, if we claim that spinal adjustment improves quality of life (QOL), but it had no effect on QOL. We committed a type 1 error.
- Also known as significance level denoted by alpha (α).
- Usually set at 5% (or 0.05).

Type 2 Errors

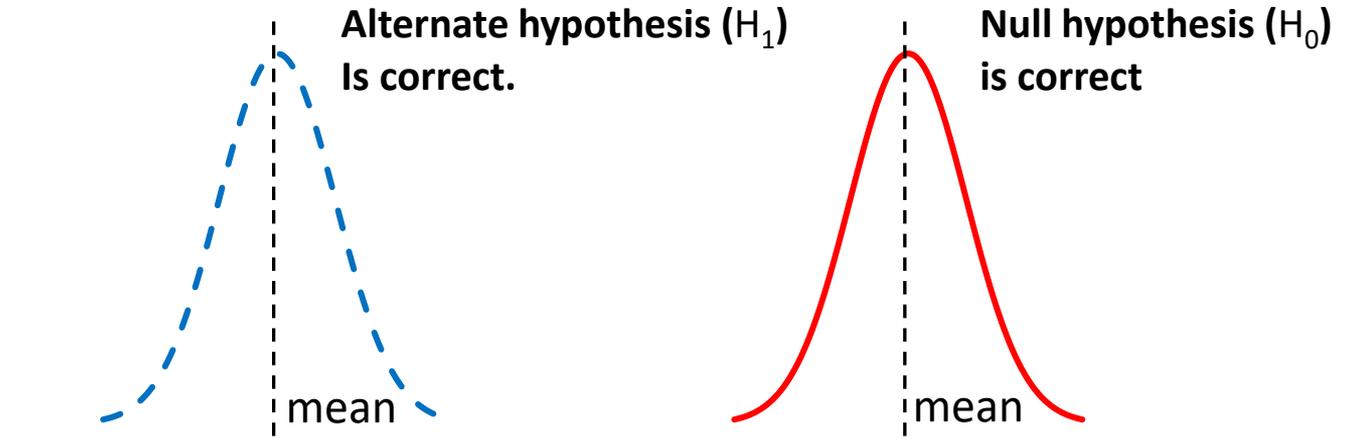
- It is the probability of not finding a difference (or accepting Null hypothesis) while there was a difference (alternate hypothesis was true).
- For example, in our example research question, if we claim that spinal adjustment does not improve quality of life (QOL) but it had affected QOL, we committed a type 2 error.
- Denoted by Beta (β).
- Power is usually $1-\beta$.
- Usually set at 80% (or 0.80).

Power-based Sample Size Calculation

- Seeing as type 2 error is linked with power, let us look at type 1 and type 2 errors with graphical distribution to understand how it affects power and sample size. Let's revisit our example hypotheses:

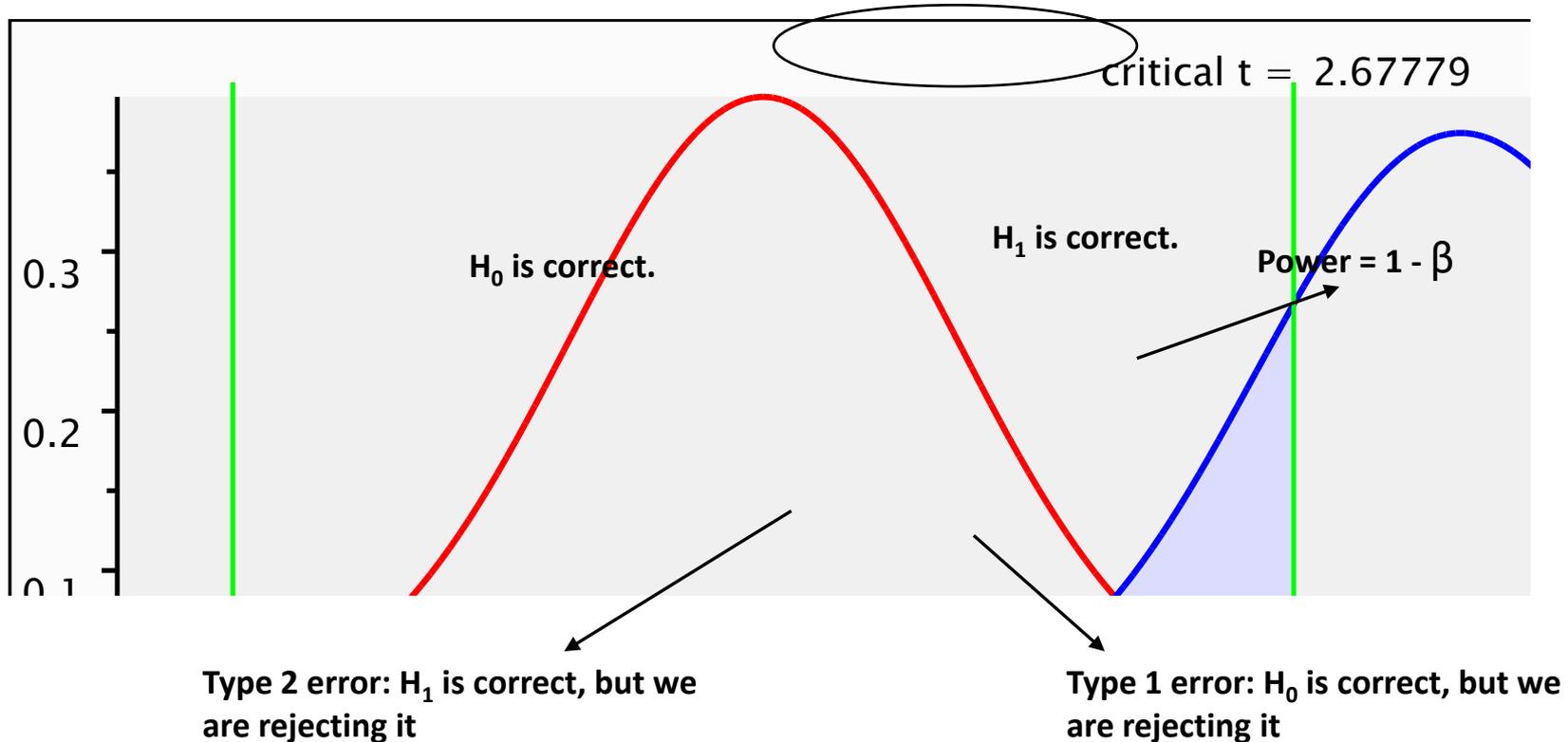
H_1 is correct (There is an affect of spinal adjustment on QOL)

H_0 is correct (There is no affect)



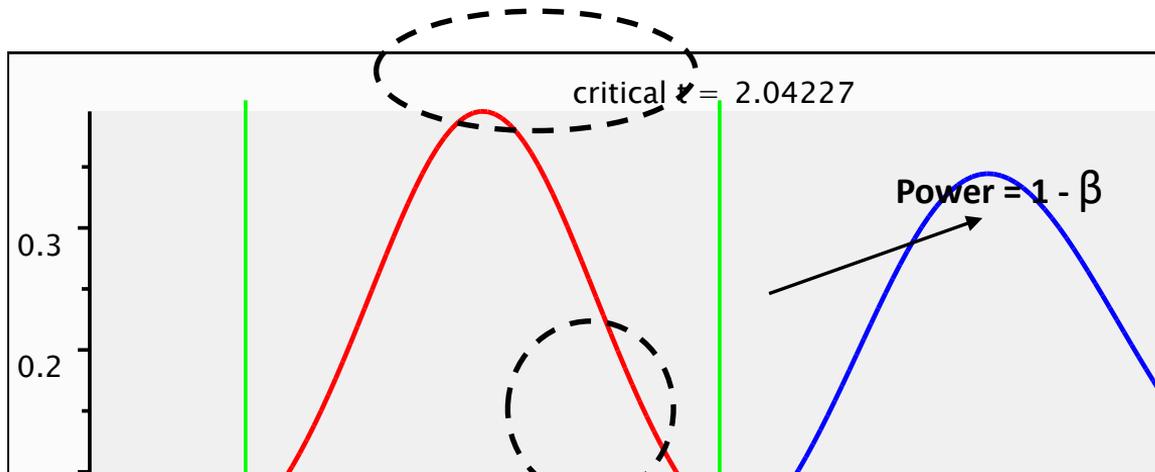
Power-based Sample Size Calculation

Critical value (t or z) is based on type 1 and type 2 errors



Power-based Sample Size Calculation

- As we can see in the previous slide, there is tradeoff between the power and type 1 error.
- For example, if we reduce type 2 error (β) this will increase the power ($1 - \beta$) but at the same time we are increasing type 1 error. Look at the distribution below:



Power-based Sample Size Calculation

- Overall, the parameters we use to calculate power:

Type 1 error = α = 0.05

Type 2 error = β = 0.20

How much difference between means you want to see (effect size) Large = 0.8, medium = 0.5, small = 0.2

We use these parameters to calculate critical value either **z** or **t** (shown in previous slide).

At the end we use this critical value with effect size to calculate sample size.

Power-based Sample Size Calculation

- Using the mentioned parameters, we can calculate sample size by:
- Using a formula (very basic mathematics)
- Using a software

Sample Size Calculation Formula

- For the scope of this study, we will use critical value of **Z** to calculate sample size.

- $$N = \frac{2 \times SD^2 \times (Z_{\alpha} + Z_{\beta})^2}{d^2}$$

- N = sample size
- SD = standard deviation (usually comes from data or literature)
- d = clinically significant difference (comes from piloting work or literature)
- $Z_{\alpha} = 1.96$ for $\alpha = 0.05$ for confidence interval 95%
- $Z_{\alpha} = 2.58$ for $\alpha = 0.01$ for confidence interval 99%

- $Z_{\beta} = 0.842$ for $\beta = 0.2$ for 80% power
- $Z_{\beta} = 1.282$ for $\beta = 0.1$ for 90% power

Sample Size Calculation Examples

- **Problem 1**
 - Research objective: to see whether spinal adjustment improves quality of life.
 - Outcome: QOL scale from 10 to 100
 - Significant clinical difference = 15 (If QOL increased by 15 after spinal adjustment it validates the hypothesis)
 - We want to be correct 80% of the time when there is a difference of 15 in QOL (Power = $1 - \beta = 0.8$).
 - With 99% confidence interval, $\alpha = 0.01$
 - Standard deviation = 30

Sample Size Calculation Examples

- Let's use the formula

- $$N = \frac{2 \times SD^2 \times (Z_\alpha + Z_\beta)^2}{d^2} = \frac{2 \times 30^2 \times (2.58 + 0.842)^2}{15^2} = \frac{1800 \times 11.71}{225} = \mathbf{(94 \text{ Sample size})}$$

- This shows that if we use 94 people, it will give us **80% power**.
- Which means that in our study 80 percent of the time, we will be able to detect 15 increase in QOL with 99% confidence interval.

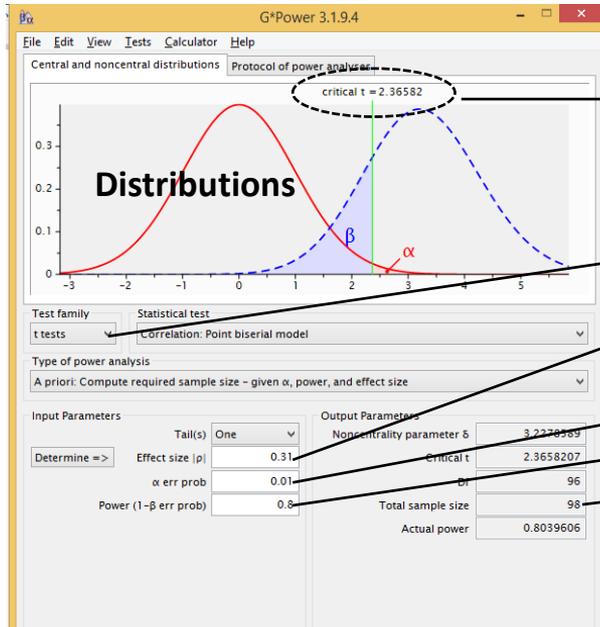
Power and Sample Size Calculation Using Software

We used formula of sample size to calculate sample size for given power. In this section, we will calculate sample size using a software.

Also, for the scope of this lesson, we will not go into mathematics of power calculation and use a software for power calculation as well.

G*Power is free software that helps you calculate power and sample size.

Sample Size Calculation Using G*Power



Critical t value

Type of test you are performing

Clinically significant effect size = 0.31 (Usually comes from literature)

Significance level = $\alpha = 0.01$

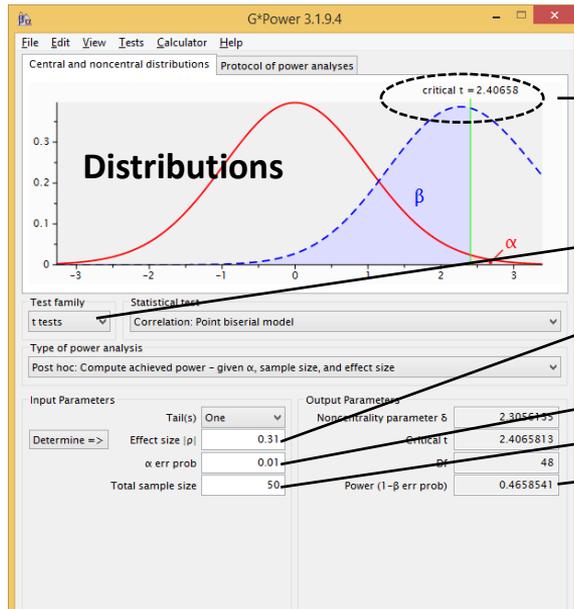
Power = $1 - \beta = 0.8 = 80\%$

Sample size calculated is **98**

If we use 98 people in our study, we will get 80% power. Which means that we will be right 80% of the time about our prediction/results. **Which is good enough.**

Power Calculation Using G*Power

- Let us calculate Power using a software with our very first example where we had only 4 months to collect data and we could collect data from 50 people. **Will 50 be enough?** let's see:



Critical value

Type of test you are performing

Clinically significant effect size = 0.31 (Usually comes from literature)

Significance level = $\alpha = 0.01$

Sample size = 50

Power calculated is **46%**

If we use 50 people in our study, we will get 46% power. Which means that we will be right 46% of the time about our prediction/results. **Which is not good enough.**

Examples – Case Study – 1 Participant

Changes in Asthma Symptoms and Bedwetting in a Four Year Old Child Receiving Chiropractic Care: A Case Report

ALI POSTLES, HEIDI HAAVIK TAYLOR and KELLY HOLT

ABSTRACT: *Objective:* This article describes and discusses changes in asthma, bedwetting and allergy symptoms in a four-year-old child receiving chiropractic care. *Clinical Features:* A four-year-old child diagnosed with asthma and a history of allergies, bedwetting and disrupted sleep presented for chiropractic care. *Intervention and Outcome:* The child received spinal and cranial adjustments based on Sacro Occipital Technique (SOT) protocol. After 32 weeks of chiropractic care the child no longer had asthma symptoms, bedwetting had ceased and a positive change in other presenting symptoms was noted. *Conclusion:* There are a growing number of case reports that describe improvements in childhood problems such as asthma and nocturnal enuresis in children receiving chiropractic care. Thus far clinical trials have failed to provide sufficient evidence to support the potential link between improvements in these childhood problems and chiropractic care. Further study is required to investigate the role chiropractors may play in caring for children with these disorders.

INDEX TERMS: ASTHMA; CHIROPRACTIC; CASE REPORTS
(PUBLICATION TYPE); NOCTURNAL ENURESIS.

Chiropr J Aust 2010; 40: 34-6.



(Postles, Haavik and Holt 2010)

Examples – Whole Head EEG Study in Denmark 19 participants (two sessions)



Example Randomized
Controlled Trial
recording at:
Baseline
After 4 weeks
After 12 weeks
60 older adults
(two groups)



(Holt et al 2016)

Summary

- A **population** is the entire group you want to look at and draw conclusions about.
- A **sample** is a specific group from a population that you will collect data from.
- **Sample size** refers to the number of participants or observations included in a study (How many subjects you need in your study?).
- Sample size vary across different research designs, therefore, to know your study design is fundamental to calculating sample sizes.
- **Type I error** is finding a difference (or rejecting Null hypothesis) when there was no difference (Null hypothesis was true).
- **Type II error** is not finding a difference (or accepting Null hypothesis) while there was a difference (alternate hypothesis was true).
- Following points should be kept in mind for sample size and power calculations:
 - Define research question well.
 - Consider your study design, outcome variable, and its measurement.
 - Chose appropriate type 1 (α) and type 2 (β) errors according to your requirement.
 - Use appropriate formula or software depending upon your statistical tests (t-test, ANOVAS etc.)

Thank You



DR. HEIDI HAAVIK

ENLIGHTENING THE
WORLD ABOUT THE
SCIENCE OF CHIROPRACTIC



Introduction to Chiropractic Care

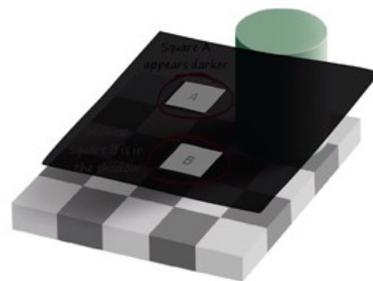
The introduction to chiropractic video series is the perfect way to gain an understanding of why chiropractic care may help you and your family.



The Beginners Guide to Chiropractic

In this first introductory video we explore what chiropractic is all about, and how it works, then we briefly explore the evidence informed effects of chiropractic care.

[View video >](#)



How the Brain Perceives the World

Did you know that your brain and central nervous system are constantly changing? It's quite amazing - from one day to the next your brain is not the same.

[View video >](#)

The Beginners Guide to Chiropractic

The Beginners Guide to Chiropractic

The word chiropractic derives from the Greek words "cheir", meaning hand, and "praktikos" meaning skilled in or concerned with. The origin of the word chiropractic can be traced back to [D.D. Palmer](#) who coined it in 1895 when he founded chiropractic.

Chiropractic care is really about total health and wellbeing

What does a Chiropractor do?

A chiropractor is a healthcare professional who specializes in the health and [function of the spine](#) and nervous system. Because of this focus on the spine, many people think chiropractors can only help with problems such as back pain, [neck pain](#) and [headaches](#). They can often help with these issues but there is much more to chiropractic than just pain.

This is the first video in our animated series "Introduction to Chiropractic". In this video, we outline what a chiropractor does, then we briefly explore the effects of care. It is a perfect one to watch for anyone that is curious about chiropractic care, and how it can help their family.

Video References

1. Rosner AL. Chiropractic Identity: A Neurological, Professional, and Political Assessment. *J Chiropr Humanit* 2016;23(1):35-45.
2. de Souza R, Ebrall P. Understanding wellness in a contemporary context of chiropractic practice. *Chiropr J Aust* 2008;38(1):12-16.
3. Schuster TL, Dobson M, Jauregui M, et al. Wellness lifestyles II: Modeling the dynamic of wellness, health lifestyle practices, and Network: Spinal Analysis. *J Altern Complement Med* 2004;10(2):357-67.
4. Henderson CN. The basis for spinal manipulation: Chiropractic perspective of indications and theory. *J Electromyogr Kinesiol* 2012.
5. Haavik H, Murphy B. The role of spinal manipulation in addressing disordered sensorimotor integration and altered motor control. *J Electromyogr Kinesiol* 2012;22(5):760-76.
6. Haavik Taylor H, Holt K, Murphy B. Exploring the neuromodulatory effects of the vertebral subluxation and chiropractic care. *Chiropr J Aust* 2010;40(1):37-44.
7. Herzog W, Zhang YT, Conway PJ, et al. Cavitation sounds during spinal manipulative treatments. *Journal of Manipulative & Physiological Therapeutics* 1993;16(8):523-6.

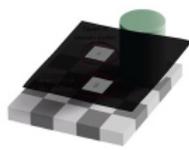




The Beginners Guide to Chiropractic

In this first introductory video we explore what chiropractic is all about, and how it works, then we briefly explore the evidence informed effects of chiropractic care.

[View Video >](#)



How the Brain Perceives the World

Did you know that your brain and central nervous system are constantly changing? It's quite amazing – from one day to the next your brain is not the same.

[View Video >](#)



Break the Pain Cycle

Did you know that pain is created in your brain to let you know that something is not ok within your body? Feeling pain is good because it is actually helpful and informative.

[View Video >](#)



Chiropractic Care and Migraines

Did you know that 1 in 6 people in the world experience migraines regularly? The World Health Organisation consider them to be the most debilitating of all neurological disorders.

[View Video >](#)



Chiropractic Affects your Brain

Your brain receives information about your body from the environment and your organs. Did you know that the muscles in your body are also sensory organs?

[View Video >](#)



What is that Pop?

If you have been adjusted before by a chiropractor you may have noticed a strange popping sound. Don't worry – it is just the formation of gas within a joint.

[View Video >](#)



Lower Back Pain

Scientists have worked out that at any one time, over 500,000,000 people around the world are suffering from low back pain and it is now the leading cause of disability worldwide.

[View Video >](#)



Growing Pains

We've all heard of growing pains right? But did you know that what we call growing pains aren't associated with growing? So they're not actually growing pains at all.

[View Video >](#)



Pain and the Immune System

Research studies have shown that the way you feel pain all depends on what's going on for you – and most importantly – what you think and feel about the situation.

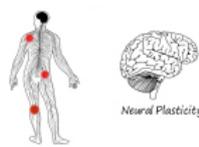
[View Video >](#)



Chiropractic and Headaches

Headaches are a sign that something is not right. Your brain will create for you the sensation of pain if it thinks there is something wrong or if there is a potential problem.

[View Video >](#)



Pain is Created in Your Brain

Did you know that the scientists now know that the feeling of pain is something your brain decides that you should experience – if it believes that there is a problem?

[View Video >](#)



Chronic Pain

Chronic pain is the second-most common reason people see a doctor and miss work. More than one-third of people with chronic pain become disabled by their pain to some degree.

[View Video >](#)



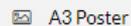
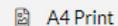
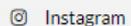
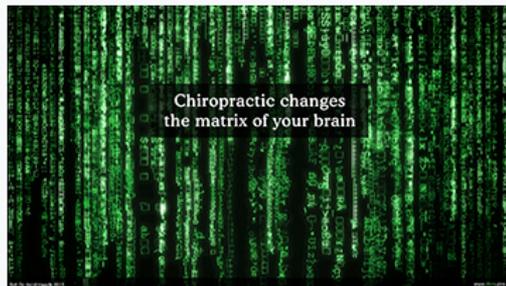
Print & Digital Assets

High-resolution images, A4 print brochures and A3 sized posters for you to download and share.

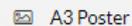
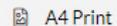
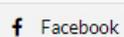
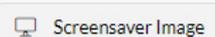


To download the digital assets, simply click on the corresponding button below the image.

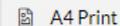
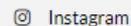
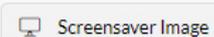
1.



2.



3.



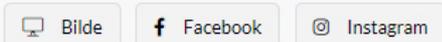
Trykte og digitale ressurser

Bilder med høy oppløsning, A4-trykte brosjyrer og plakater i A3-størrelse som du kan laste ned og dele.



For å laste ned de digitale eiendelene, klikker du bare på den aktuelle knappen under bildet.

1.



 A4-utskrift  A3-plakat

2.



 A4-utskrift  A3-plakat

3.



 A4-utskrift  A3-plakat

Chiropractic Research

Research summary articles to read, download and print (members only) all backed by the latest scientific research studies.



Chronic Pain

Chronic pain that has persisted for more than 3 months is no longer protective, nor informative. So, what is chronic pain and what can you do about it?

[Read more »](#)



Pain is in the Brain

Sometimes pain persists long after tissue damage has actually healed. When pain persists for more than three months we call this chronic pain.

[Read more »](#)



Neck Pain

Up to half the world's population suffers from neck pain at some stage. For some, one big problem is that it just keeps coming back, or becomes chronic.

[Read more »](#)



UNDERSTANDING PAIN



Dr. Kelly Holt

BSc, BSc(Chiro), PGDipHSc, PhD

Dr. Heidi Haavik

BSc(Physiol), BSc(Chiro) PhD

Experiencing pain is normal. Everyone experiences pain now and then.¹ Pain is supposed to be protective to make you stop doing things that may be dangerous.² But chronic pain that has persisted for more than 3 months is no longer protective, nor is it helpful.³ So, what is chronic pain and how do you deal with it if you suffer from it?

PAIN IS CREATED IN THE BRAIN



Dr. Kelly Holt

BSc, BSc(Chiro), PGDipHSc, PhD

Dr. Heidi Haavik

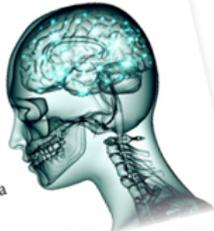
BSc(Physiol), BSc(Chiro) PhD

Did you know that scientists now know the feeling of pain is something your brain decides you should experience if it believes there is some tissue damage in your body?¹ In fact, your brain can decide that you should feel pain even if it only thinks there is a potential threat of tissue damage!!!²⁻⁵

It may seem strange, but it's totally up to your brain to decide whether you should feel pain or not. Your brain may decide you should experience pain even if you have no actual tissue damage yet,⁶ or your brain may not create the feeling of pain for you when tissue damage has actually occurred!^{7,8}

heals the problem.¹ This pain is helpful and informative.¹ If we listen to our body these pain experiences can be a good thing.

But for some people, pain can persist even after the initial injury that caused it has healed.^{9,11,12} And for some people, the pain in these areas that are not injured at all, become non-



brain
anger
that
issue
are
ell,



types of pain is the
100% of the time,
not mean it's not r
itself is created in
you can get rid of
on what you thi
important you u

Your pain exp
as decided y
reating the
ce.⁵ It can

NECK PAIN AND FALLS RISK

Dr. Kelly Holt

BSc, BSc(Chiro), PGDipHSc, PhD

Dr. Heidi Haavik

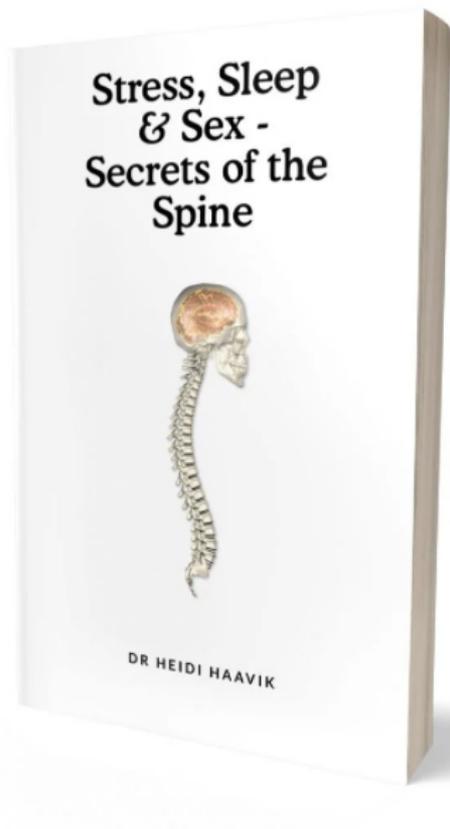
BSc(Physiol), BSc(Chiro) PhD



Neck pain is very common throughout the world.¹ Up to half of all people around the world suffer from neck pain at some stage each year.²⁻⁵ For some people, one big problem with neck pain is that it just keeps coming back, or becomes chronic, and may even increase their risk of suffering from a fall.^{2,4,6,7}

Scientists know that your brain uses sensory information from your muscles and joints around your spine to help control your balance and posture and to make sure you're moving properly.^{1,2} When your brain takes sensory information and uses it to help guide movements and control muscles we call this sensorimotor function.³ One particular study looked at whether neck pain has an impact on proper sensorimotor function in older people.⁷ In this study, the researchers ran a whole lot of tests of sensorimotor function, like how well the study participants controlled the movement of their eyes and how good their balance was, and they took into account their age and other conditions that they suffered from.





Get notified when this book is published!

Notify me when Dr Haavik's new book is published. Simply enter your details in the form below:

* indicates required

Email Address *

First Name

Last Name

Notify Me

www.secretsofthespine.com