Wildtier Schweiz

Key elements of study design

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Key elements of study design

The **study design** (or research design) is a **plan** to answer a research question with sound scientific evidence.

It includes:

- clear formulation of aims and hypotheses
- adequate choice of methods
- precise documentation of the applied methods
- precise data logging
- sound data analysis (awareness of the assumptions!)

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Aims

To define interesting aims:

- personal interest and interest of the public/sponsors/government
- read literature and discuss with other researchers:

  what is currenty known/unknown, important to know?

Formulate specific and precise research questions and the corresponding hypotheses.

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Hypotheses

A hypothesis contains one independent variable – the cause (predictor) – and one dependent variable – the supposed effect (response).

Null Hypothesis:
A statement about a parameter

Alternative Hypothesis:
A statement that directly contradicts the null hypothesis

In a study, we test if we find statistical evidence to reject the null hypothesis (no relationship between variables).

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Example of questions and hypotheses

General question: Are black grouses affected by freeriders?

H_o: black grouses are not affected by freeriders.

H_a: black grouses are affected by freeriders.

not quantifiable => not a useful hypothesis!

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Example of questions and hypotheses

More specific question: Does black grouse physiology differs in regions with and without freeriders?

Main hypothesis („Leithypothese“):

H_o: black grouse physiology does not differ between regions with and without freeriders.

H_a: black grouse physiology does differ between regions with and without freeriders.

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Examples of questions and hypotheses

Working questions:

1. Is black grouse corticosterone level higher in regions with freeriders than without freeriders?

2. Is black grouse heart rate higher in regions with freeriders than without freeriders?

3. Is offspring number of black grouses lower in regions with freeriders than without freeriders?

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Examples of questions and hypotheses

for question 1. Is black grouse corticosterone level higher in regions with freeriders than without freeriders?

1. 1. Working hypothesis („Arbeitshypothese“)

H_0: corticosterone level in black grouse **scats** does not differ in regions with freeriders and in regions without freeriders.

H_a: corticosterone level in black grouse scats is higher in regions with freeriders than regions without freeriders.

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Examples of questions and hypotheses

1. 2 Working hypothesis („Arbeitshypothese“)

H_0: corticosterone level in black grouse **blood** does not differ in regions with freeriders and in regions without freeriders.

H_a: corticosterone level in black grouse blood is higher in regions with freeriders than regions without freeriders.

depends on your educated guess: could also be „different“ or „lower“

Define what you consider as a „region with freerider“

Caution: correlation ≠ causality

(be aware of confounding factors!)

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Key elements of study design

The **study design** (or research design) is a **plan** to answer a research question with sound scientific evidence.

It includes:

- clear formulation of aims and hypotheses
- adequate choice of methods
- precise documentation of the applied methods
- precise data logging
- sound data analysis (awareness of the assumptions!)

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Adequate choice of methods

Many methods exist.

All methods have pro and contra.

Often, there is not only one „correct“ method.

Often, different methods/techniques are combined and applied in one single study.

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Adequate choice of methods

Methods need to be chosen and adapted for every study, **depending on** study **objectives** and constraints (habitat, study species, time and ressources, assumptions of the model used for data analysis, etc).

Assess the combination of methods which is adequate for your particular study!

Maximize sample size and detection probability

Minimize bias and violation of assumptions

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Key elements of study design

The **study design** (or research design) is a **plan** to answer a research question with sound scientific evidence.

It includes:

- clear formulation of aims and hypotheses
- adequate choice of methods
- precise documentation of the applied methods
- precise data logging
- sound data analysis (awareness of the assumptions!)

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Documentation of methods

Try out the potentially adequate method in a pilot study and document potential failures.

Once you chose the adequate method,

describe every step of your methods in detail (incl. field material type, etc)

and strictly STICK TO IT (never change the method within a study)

important for replicability and for data analysis

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Data logging

What kind of statistical analysis do I wish to do?

What kind of data do I need for these analyses?

How should I enter my data in the digital data table: columns or lines?
What are the possible entries (categories/numbers/descriptions)?

	A	B	C	D	E	F	G	J	K	L	M	N	
1	**WKM**	**ID_Nr**	**Latte**	**Kantc**	**Planungsj**	**ID_Probe**	**NameMita**	**Dat_Kontrolle**	**Kontr**	**Dat_Gefriere**	**HaarmengeB**	**Unbrauchk**	**h**
2	WKMIII	548210	A	NE	2018/19	H001	Dupré	10.12.2018	1	18.12.2018	einzelne	x nicht Katze	
3	WKMIII	548210	C	NE	2018/19	H002	Dupré	10.12.2018	1	18.12.2018	einzelne	x nicht Katze	
4	WKMIII	548218	A	NE	2018/19	H003	Dupré	10.12.2018	1	18.12.2018	einzelne	x nicht Katze	
5	WKMIII	530202	B	NE	2018/19	H004	Dupré	10.12.2018	1	18.12.2018	einzelne		
6	WKMIII	489118	A	GE	2018/19	H005	Müller	12.12.2018	1	18.12.2018	einzelne		
7	WKMIII	489118	C	GE	2018/19	H006	Müller	12.12.2018	1	18.12.2018	viele+		n
8	WKMIII	489119	C	GE	2018/19	H007	Müller	12.12.2018	1	18.12.2018	einzelne		3
9	WKMIII	489120	A	GE	2018/19	H008	Müller	12.12.2018	1	18.12.2018	einzelne	x nicht Kat	2
10	WKMIII	489120	C	GE	2018/19	H009	Müller	12.12.2018	1	18.12.2018	viele		
11	WKMIII	560210	B	NE	2018/19	H010	Bardet	13.12.2018	1	18.12.2018	einzelne		
12	WKMIII	605222	C	SO	2018/19	H011	Stüdeli	20.12.2018	1	10.01.2019	wenige		V
13	WKMIII	596242	A	JU	2018/19	H012	Berberat	25.12.2018	1	10.01.2019	einzelne	x a priori u	v

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Data logging

Where do I get my data from?
Which variables do I need to log in the field?

Do a user-friendly* protocol-sheet for field work

*entries as few as possible, as much as necessary
logical order of entries, enough space for writing

Check in the field that you completed all entries of the protocol

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Key elements of study design

The **study design** (or research design) is a **plan** to answer a research question with sound scientific evidence.

It includes:

- clear formulation of aims and hypotheses
- adequate choice of methods
- precise documentation of the applied methods
- precise data logging
- sound data analysis (awareness of the assumptions!)

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch

Wildtier Schweiz

Thank you for your attention!

Beatrice Nussberger, +41 (0)44 635 61 38, beatrice.nussberger@wildtier.ch
Wildtier Schweiz, Winterthurerstrasse 92, CH-8006 Zürich, www.wildtier.ch