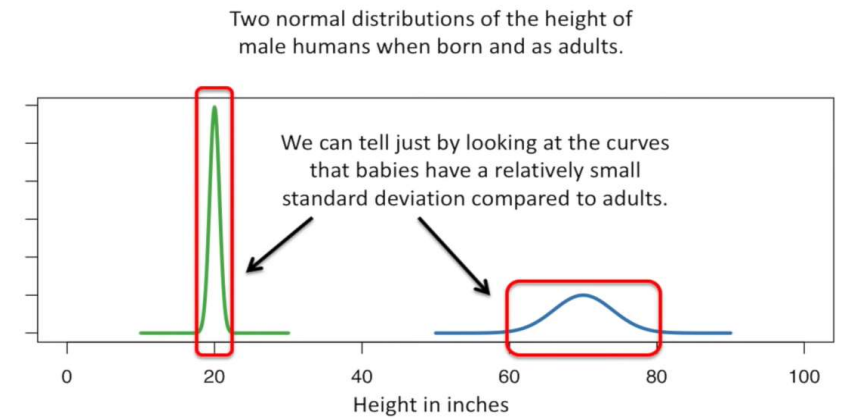# Learning Analytics / EDM
Für Lehrpersonen

- EDM / Learning Analytics
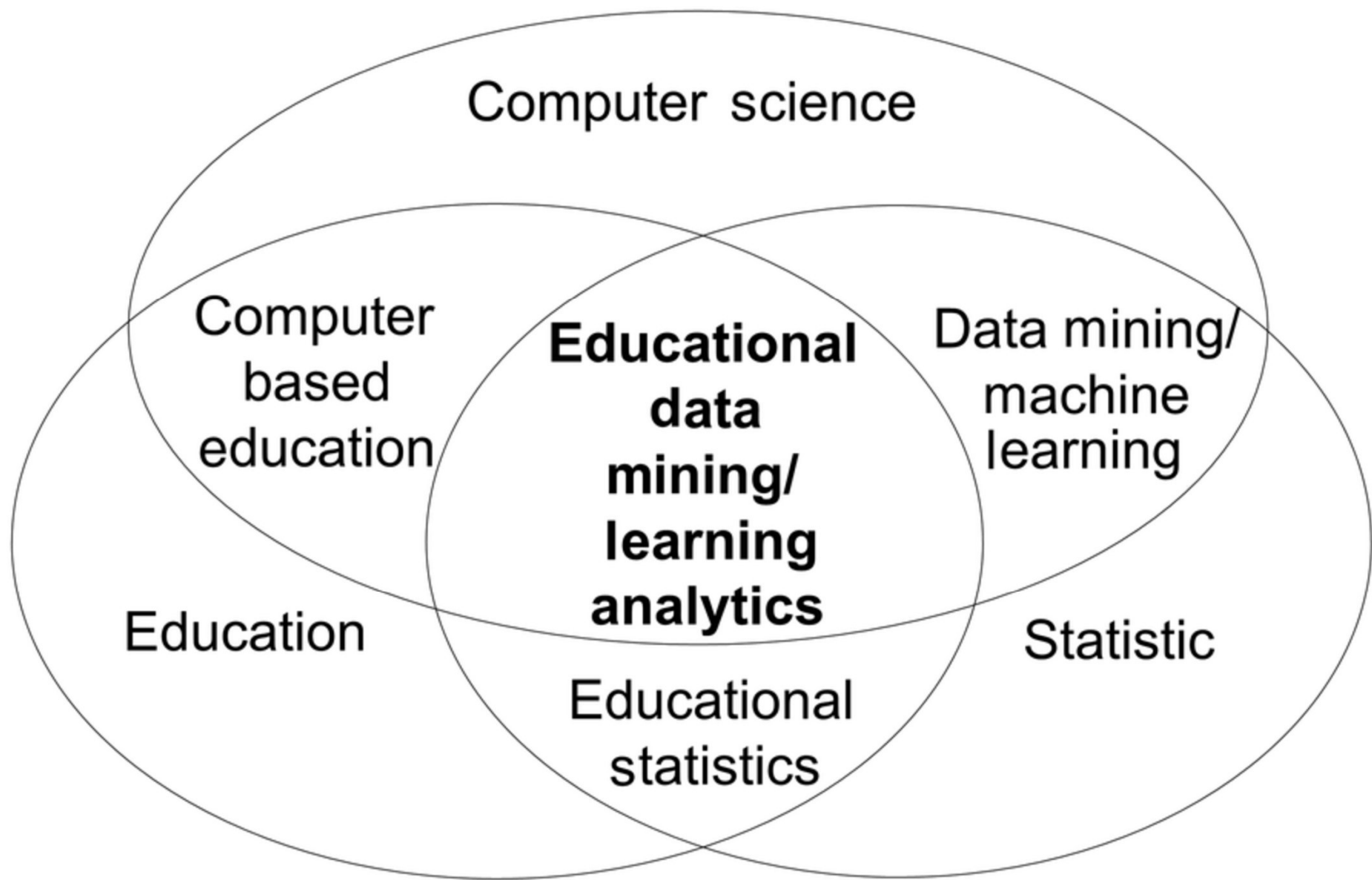- Methoden aus Learning Analytics
- Use Case: Prüfung analysieren

Disclaimer: Diese Folien benutzt Begriffe aus der Statistik in einer haarsträubenden Vereinfachung.

https://www.youtube.com/watch?v=Uvn7diE9C-E&list=PLu-U4gWcFfPxmKviyopGSmOY2EaKLVYxF

https://www.youtube.com/watch?v=J4Wdy0Wc_xQ

Computer science

Computer based education

Educational data mining/ learning analytics

Data mining/ machine learning

Education

Educational statistics

Statistic

Educational Data Mining / Learning Analytics

EDM

Educational data mining focuses on developing new tools and algorithms for discovering data patterns

EDUCATIONAL DATA MINING CAN ANSWER QUESTIONS LIKE:

- What sequence of topics is most effective for a specific student?
- Which student actions are associated with better learning and higher grades?
- Which actions indicate satisfaction and engagement?
- What features of an online learning environment lead to better learning?

LA

Learning analytics focuses on applying tools and techniques at larger scales in instructional systems

LEARNING ANALYTICS CAN ANSWER QUESTIONS LIKE:

- When are students ready to move on to the next topic?
- When is a student at risk for not completing a course?
- What grade is a student likely to receive without intervention?
- Should a student be referred to a counselor for help?

- Deskriptive Statistik
- Assoziation
- Hypothesenprüfung
- Clustering
- Klassifikation
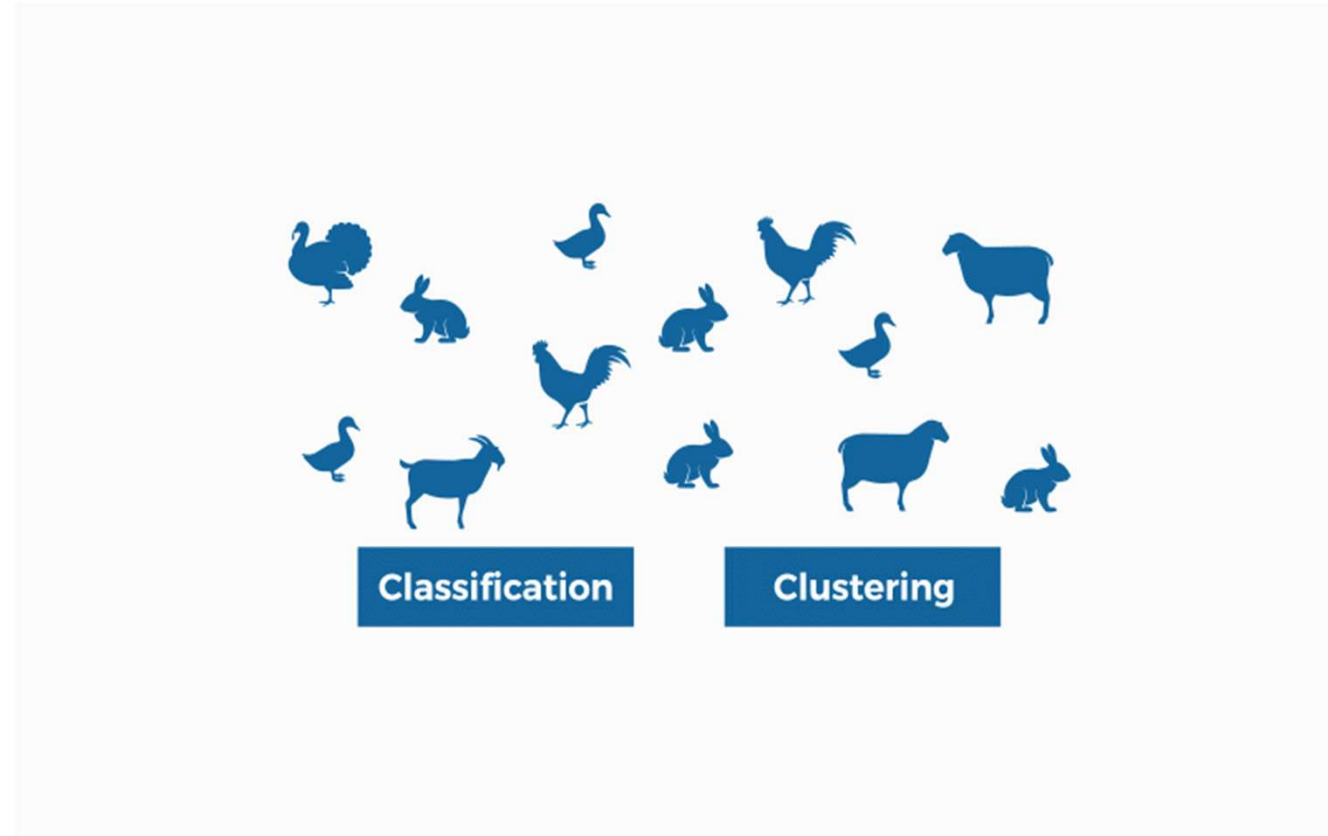
Arten von Daten
Variable = Eigenschaft, die wir messen können
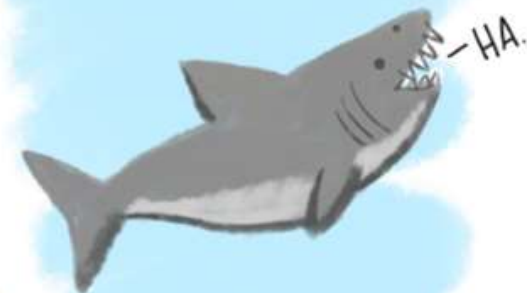
– Deskriptive Statistik
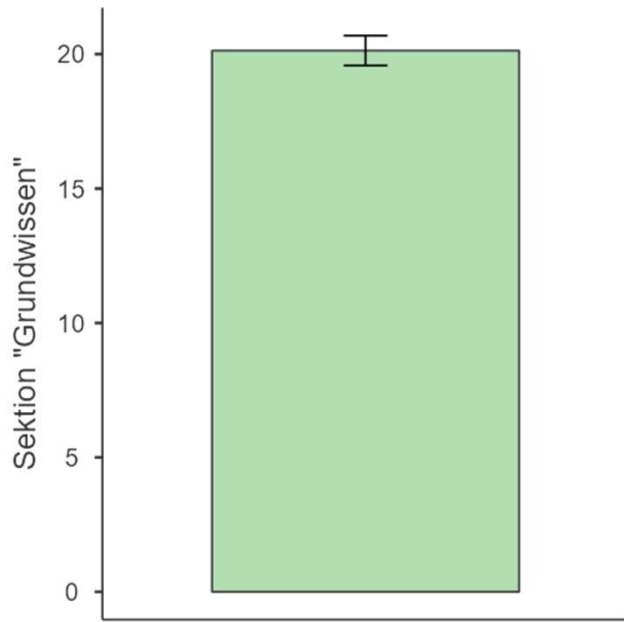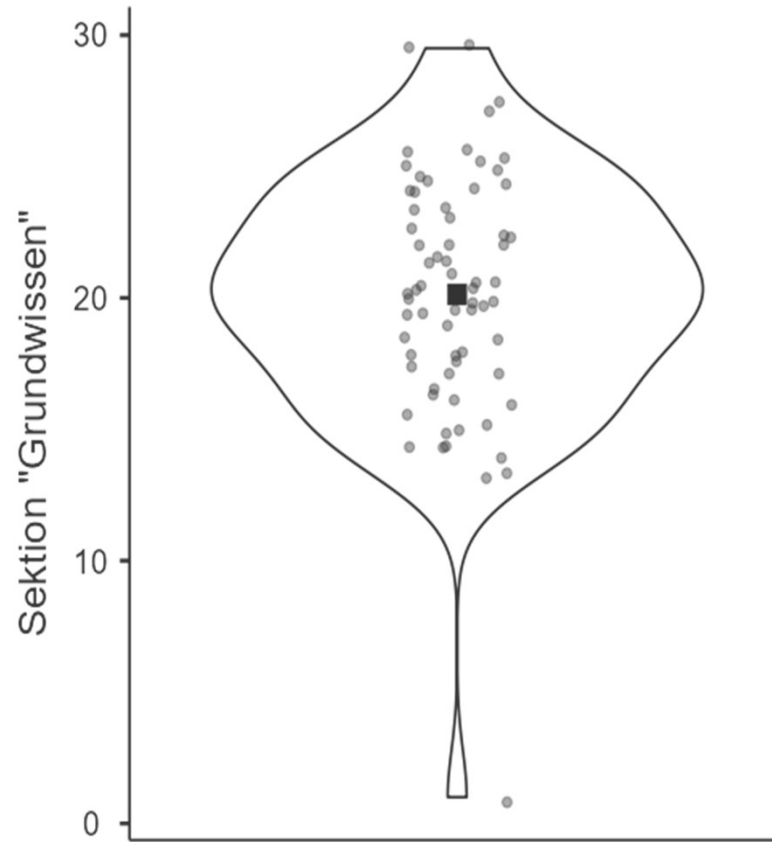
Barplot   **Violin Plot mit Jitter**   **Histogramm**
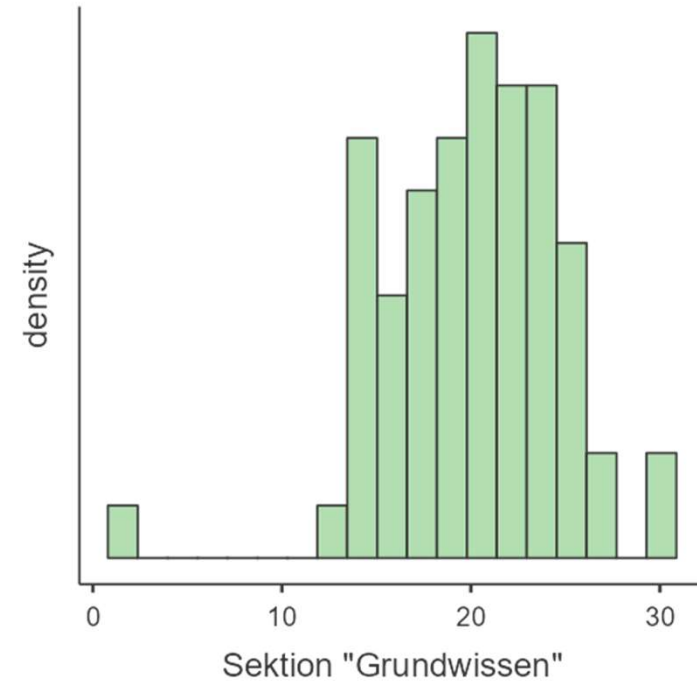
Assoziation (Korrelation)

Hr. Hänger:

Französisch 3.0

Mathematik: 3.5

Fr. Fleissig:

Französisch 5.0

Mathematik: 5.5

1. Positive Correlation

r = 0.73

Variable 1

Variable 2

2. Negative Correlation

r = -0.87

Variable 1

Variable 2

3. No Correlation

r = -0.029

Variable 1

Variable 2
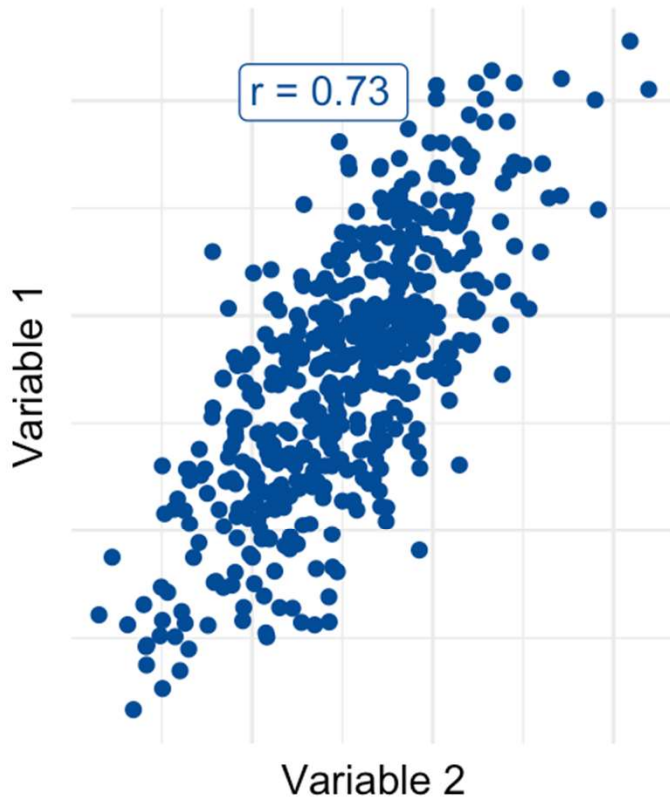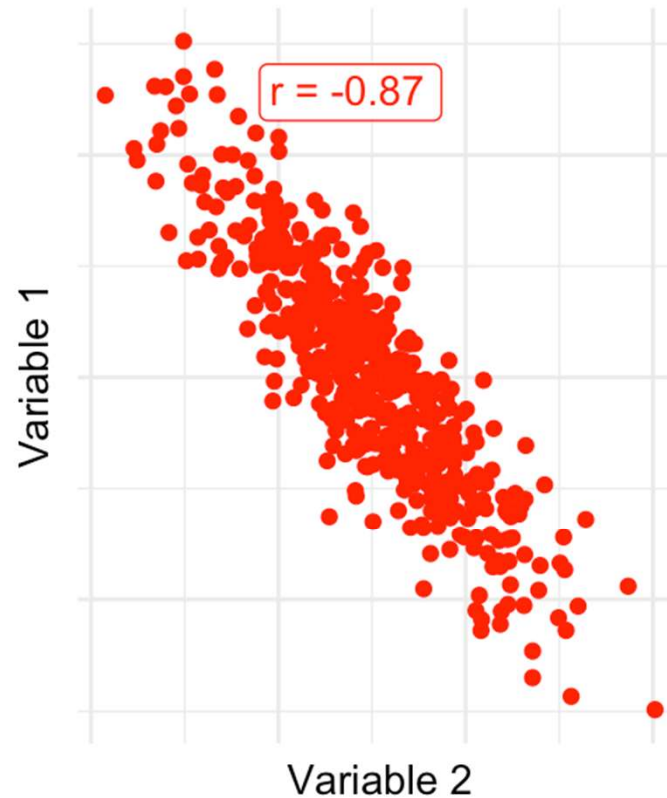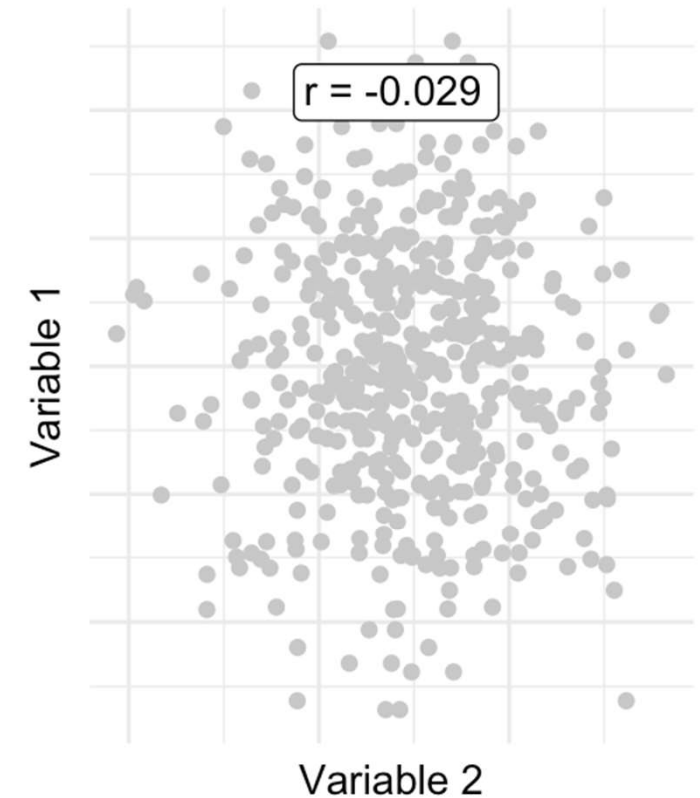
- Ein Wert von 1 bedeutet eine perfekte positive Korrelation.
- Ein Wert von -1 bedeutet eine perfekte negative Korrelation.
- Ein Wert von 0 bedeutet keine Korrelation.
- In Psychologie/Erziehungswissenschaft gelten Werte > 0.3 als hoch.

Korrelation nicht immer kausal

Number of people who drowned by falling into a pool
correlates with
Films Nicolas Cage appeared in
Correlation: 66.6% (r=0.666004)

Data sources: Centers for Disease Control & Prevention and Internet Movie Database

https://www.tylervigen.com/spurious-correlations
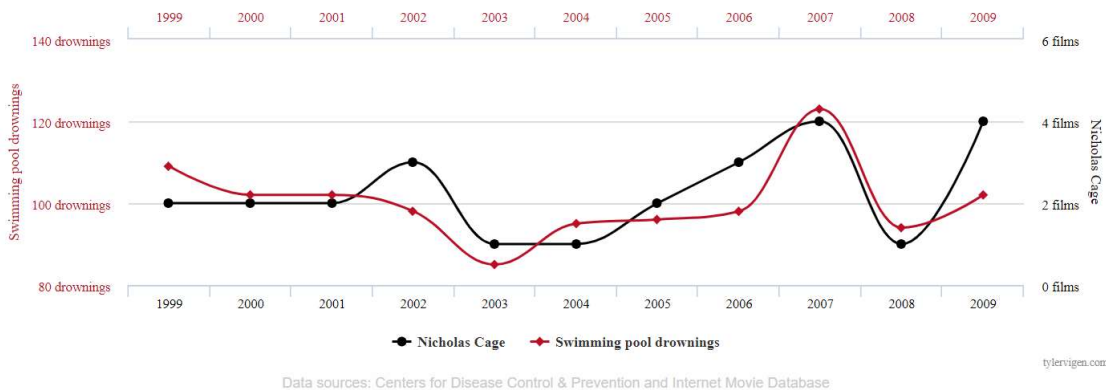
Korrelation zwischen dem Rückgang der Storchenpopulation und der Abnahme der Geburtenzahl in Baden-Württemberg

Zahl der Storchenpaare in Baden-Württemberg

Zahl der Lebendgeborenen in Baden-Württemberg

Abbildung aus der Monographie „Kontrazeption mit Hormonen"
Von Prof. Dr. Hans-Dieter Taubert und Prof. Dr. Herbert Kuhl (Georg Thieme Verlag, Stuttgart 1981)

Item Rest-Correlation (Richtwert: > 0.25)

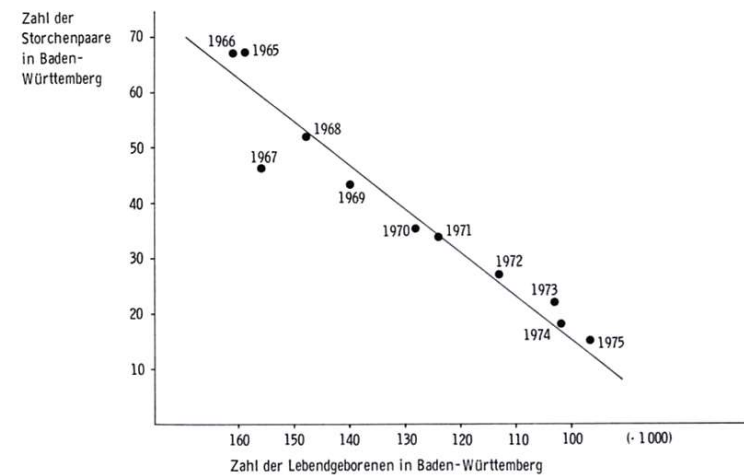| CES-D					ZSDS				
Item	Item-Test Correlation	Item-Rest Correlation	Average Inter-Item Covariance	Cr-α in absence of item	Item	Item-Test Correlation	Item-Rest Correlation	Average Inter-Item Covariance	Cr-α in absence of item
1. I was bothered by things that usually don't bother me.	0.57	0.52	0.48	0.93	1. I feel down-hearted and blue	0.76	0.72	0.26	0.88
2. I did not feel like eating; my appetite was poor.	0.51	0.46	0.49	0.93	2. Morning is when I feel the best	0.18	0.10	0.30	0.90
3. I felt that I could not shake off the blues even with help from my family or friends.	0.80	0.77	0.46	0.93	3. I have crying spells or feel like it	0.63	0.58	0.27	0.88
4. I felt I was just as good as other people.	0.36	0.29	0.50	0.93	4. I have trouble sleeping at night	0.61	0.55	0.27	0.89
5. I had trouble keeping my mind on what I was doing.	0.58	0.52	0.48	0.93	5. I eat as much as I used to	0.40	0.31	0.28	0.89
6. I felt depressed.	0.82	0.79	0.46	0.92	6. I still enjoy sex	0.45	0.36	0.28	0.89
7. I felt that everything I did was an effort.	0.52	0.46	0.48	0.93	7. I notice that I am losing weight	0.40	0.33	0.28	0.89
8. I felt hopeful about the future.	0.61	0.56	0.48	0.93	8. I have trouble with constipation	0.48	0.41	0.28	0.89
9. I thought my life had been a failure.	0.72	0.68	0.46	0.93	9. My heart beats faster than usual	0.52	0.46	0.28	0.89
10. I felt fearful.	0.74	0.71	0.46	0.93	10. I get tired for no reason	0.60	0.54	0.27	0.89
11. My sleep was restless.	0.65	0.60	0.47	0.93	11. My mind is as clear as it used to be	0.68	0.62	0.26	0.88
12. I was happy.	0.71	0.67	0.47	0.93	12. I find it easy to do the things I used to	0.66	0.60	0.27	0.88
13. I talked less than usual.	0.55	0.50	0.49	0.93	13. I am restless and can't keep still	0.52	0.45	0.27	0.89
14. I felt lonely.	0.79	0.76	0.45	0.93	14. I feel hopeful about the future	0.66	0.60	0.27	0.88
15. People were unfriendly.	0.59	0.54	0.48	0.93	15. I am more irritable than usual	0.63	0.57	0.27	0.88
16. I enjoyed life.	0.72	0.68	0.46	0.93	16. I find it easy to make decisions	0.60	0.54	0.27	0.89
17. I had crying spells.	0.70	0.66	0.47	0.93	17. I feel that I am useful and needed	0.71	0.67	0.26	0.88
18. I felt sad.	0.83	0.81	0.45	0.92	18. My life is pretty full	0.77	0.73	0.26	0.88
19. I felt that people dislike me.	0.58	0.54	0.48	0.93	19. I feel that others would be better off if I were dead	0.48	0.42	0.28	0.89
20. I could not get "going."	0.77	0.74	0.46	0.93	20. I still enjoy the things I used to do	0.73	0.68	0.26	0.88

CES-D: Center of Epidemiological Studies Depression Scale, ZSDS: Zung Self Rating Depression Scale, Cr-α: Cronbach's Alpha.
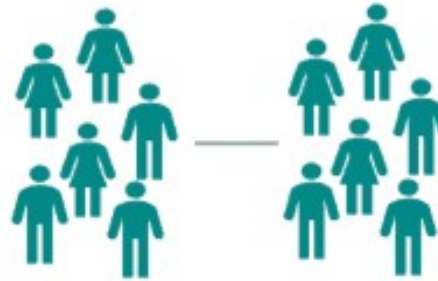doi:10.1371/journal.pone.0045413.t002

https://www.researchgate.net/figure/Item-test-Item-rest-correlation-average-inter-item-covariance-and-alpha-in-absence-of_fig4_232232789

Reliabilität = interne Konsistenz Wie genau misst der Test?

Cronbachs Alpha, McDonalds Omega

Werte > 0.8

Hypothesenprüfung

Gibt es einen
Unterschied zwischen
zwei Gruppen

Hr. Hänger: 4.5

Hr. Chiller: 3.0

Fr. Lockerflockig: 3.5

Fr. Gemütlichkeit 5.0

Hr. Strebsam 5.5

Hr. Motivator 6.0

Fr. Fleissig: 6.0

Fr. Lerner 5.0

Independent Samples T-Test

Independent Samples T-Test

		Statistic	df	p		Effect Size
Leistungen_Mathe	Student's t	−0.124	155	0.901	Cohen's d	−0.0203

Note. H_a $\mu_1 \neq \mu_2$