# Applied social psychology: The case of hand hygiene in clinical settings

Svenja Diefenbacher (Ulm University)
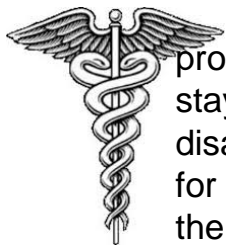and Claudia Sassenrath, Stefan Pfattheicher & Johannes Keller (Ulm University)

# 1. Introduction

## Why hospital hand hygiene?

**Problem:**

HAIs

**GER:** 0,6 to 1,2 million/year
**WORLD**: 1,4 million at any time

prolonged hospital stay, long-term disability, high costs for patients and their families

excess death,
**GER**: >6.000/y
**EUR**: >135.000/y

MRSA increased resistance of micro-organisms

VRE

massive financial burden,
**EUR**: >13-24 bill. €

(Walger, Popp & Exner, 2013 *Hyg Med;* WHO, 2009)

**Solution:**

Hand hygiene (HH)



"Healthcare workers' hands are the **most common vehicle for the transmission** of healthcare-associated pathogens from patient to patient and within the healthcare environment."

(Allegranzi & Pittet, 2009, *J Hosp Inf*: 305)

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## Introduction

**Why hospital hand hygiene?**

**Problem:**

low hh compliance

i.e. HH according to recommendations

few hospitals
>80% HHC

**Solution?**

*behavioural science*

General research questions:

**explain HH**

**improve HH**

**measuring HH**

# Introduction

## What is hospital hand hygiene?

Hospital hand hygiene (HHH) ≠ personal hand hygiene regarding:

**1. (Most important) HHH indications:**
- before patient contact
- before aseptic task
- after body fluid exposure risk
- after patient contact
- after contact with patient surroundings

*10 HHO/h in ICU* (Scheithauer et al., 2009)

**Shared (more or less) hygiene knowledge:**
- after toilet use
- before eating or preparing food
- after touching animals
- after touching money
- after commuting or being outside
- …

Nevertheless: **Processes driving the behaviour can be assumed to be similiar**

**2. (Most important) HHH action:**
- Hand disinfection by alcohol-based hand rub

**HH action:**
- washing hands with soap & water

**3. High impact:** e.g. patients get sick/die, cause an epidemic, spread of MDRO, high financial burden

**Low(er) impact:** less severe, mainly affecting oneself (some exceptions: e.g. highly infectious deseases, high density sites)

**4. Strong evidence** for WHEN & HOW to perform HHH (official & mandatory guidelines)

**Little evidence** for WHEN & HOW to perform personal HH

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# Introduction

## Theoretical approaches

- HHH as **automatic behaviour**

  → implicit attitude towards hand hygiene (Diefenbacher, Sassenrath, Siegel, Grünewald & Keller, 2012), 2. habit (Diefenbacher, Pfattheicher & Keller, in preparation), implementation intentions

- HHH as (distant) **prosocial behaviour**

  →1. empathy (Sassenrath, Diefenbacher, Siegel, & Keller, 2016)

- HHH as **socially desirable behaviour**

  → social presence, norms

3. measuring HH

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# Emotional empathy and hospital hand hygiene

## Research question

Emotional empathy…

- …sensitivity regarding the (emotional) experiences of another person (Davis, 1983)
- …allows to affectively connect with another person and increases the importance of other people's well-being (Davis, 1983; Galinsky, Maddux, Gilin, & White, 2008)
- …is a moral emotion, helping individuals to do what they think is right (e.g. Tangney, Stuewig, & Mashek, 2007)

(Hospital) hand hygiene…

- …significantly influences other individuals' health.

Orienting oneself towards others' fortune should make the consequences of hand hygiene *for others* more salient.

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# Previous evidence

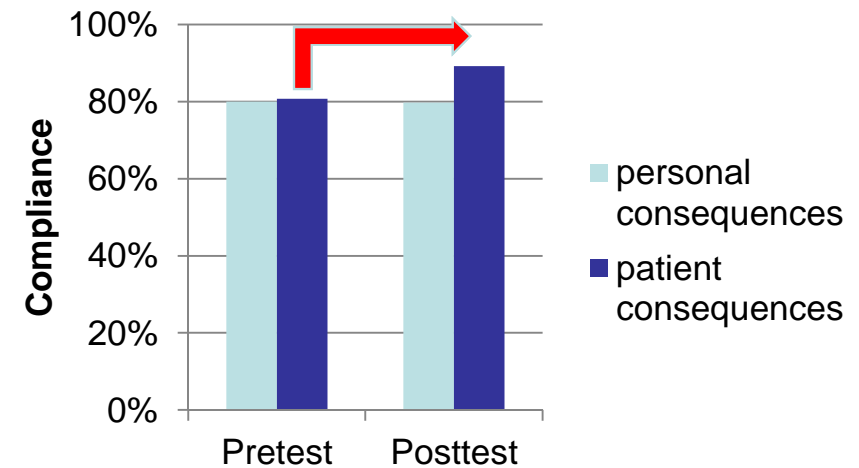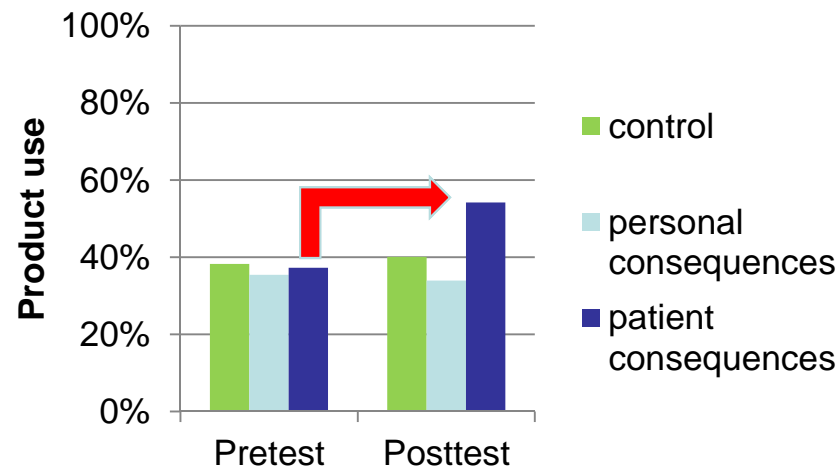## Grant & Hofmann (2011 *Psychol Sci*)

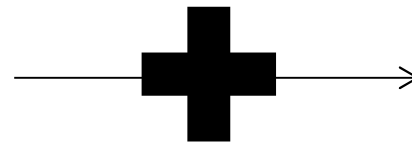| "Gel in, wash out." | "Hand hygiene prevents you from catching diseases." | "Hand hygiene prevents patients from catching diseases." |

„empathy condition"

# Influence of empathy on hospital hand hygiene

## Study 1 to 4



**n = 62** (51 w, 11 m, 59 caregivers, 3 physicians, $M_{age}$ = 39.0, $SD_{age}$ = 10.9, $range_{age}$: 21 − 62)

**n = 72** (61 w, 11 m, $M_{age}$ = 20.3, $SD_{age}$ = 2.5, $range_{age}$: 17 − 31)

**n = 150** (87 w, 62 m, $M_{age}$ = 21.4, $SD_{age}$ = 2.2, $range_{age}$: 18 − 31)

4 units

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## Methods

**Operationalization of empathy and (hospital) hand hygiene**



Emotional Empathy-Scale (Mehrabian & Epstein, 1972)

Text-based empathy manipulation (Batson et al., 1997; Davis, 1983; Olson & Wells, 2012)

Picture-based empathy manipulation (Sassenrath, et al., 2016)

Self-report by Day Reconstruction Method (DRM) (Kahneman, et al., 2004)

Observed hand hygiene during food preparation "in elderly home" (Sassenrath, et al., 2016)

Automatic count of dispenser use

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# Empathy Study 1 & 2 - questionnaire

## Methods overview, results

| | b | SE | Beta | t | p |
|---|---|---|---|---|---|
| **Model 1** | | | | | |
| *Adj. R²* = .113, *F*(5,56) = 2.551, *p* =.038 | | | | | |
| Empathy | .381 | .178 | .270* | 2.142 | .037 |
| Conscientiousness | .923 | .428 | .306* | 2.154 | .036 |
| Neuroticism | .564 | .326 | .248† | 1.732 | .089 |
| Social desirability | .150 | .254 | .072 | .589 | .558 |
| Job satisfaction | .202 | .251 | .108 | .803 | .425 |

α = .82
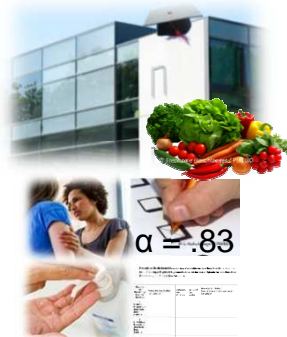
| | b | SE | Beta | t | p |
|---|---|---|---|---|---|
| **Model 1** | | | | | |
| *Adj. R²* = .045, *F*(1,70) = 4.374, *p* =.040 | | | | | |
| Empathy | .884 | .423 | .243* | 2.092 | .040 |

α = .83

→ Self-reported empathy positively predicts self-reported (DRM) HH
for HCW at their workplace and in private food preparation.

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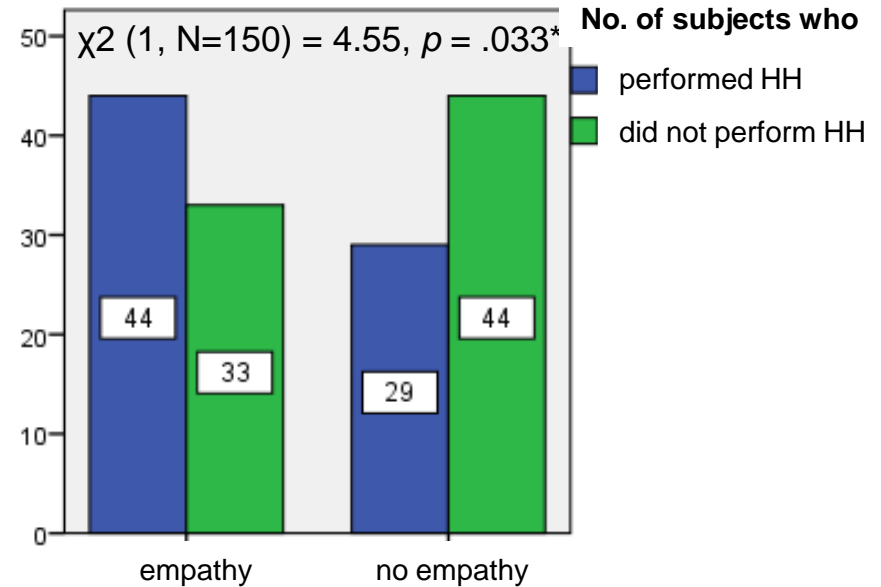ulm university  universität
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# Empathy Study 3 – lab experiment

## Methods overview, results

Text-based empathy manipulation

Observed HH during food preparation
("elderly home")

$\chi^2 (1, N=150) = 4.55, p = .033*$

**No. of subjects who**

- performed HH
- did not perform HH

44

33

29

44

empathy        no empathy

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# Empathy Study 4 – field experiment
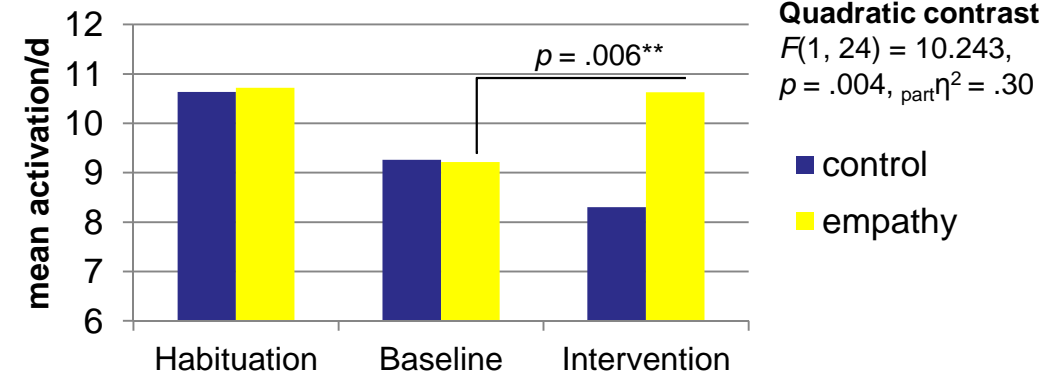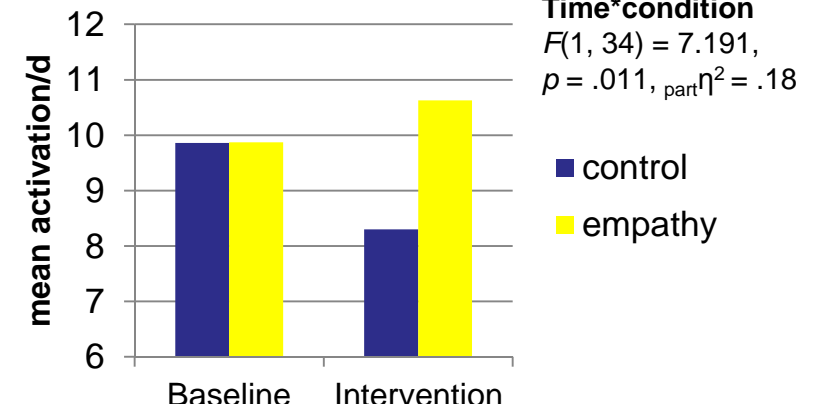
## Methods overview, results

Picture-based empathy manipulation

Empathy (3 connected wards, Ø 22.8 HCW/day) Control (1 ward, Ø 7.8 HCW/day)

Automatic count of dispenser use

by study period

**Time*condition**
$F(1, 34) = 7.191$,
$p = .011$, $_{part}\eta^2 = .18$

■ control
■ empathy

**Quadratic contrast**
$F(1, 24) = 10.243$,
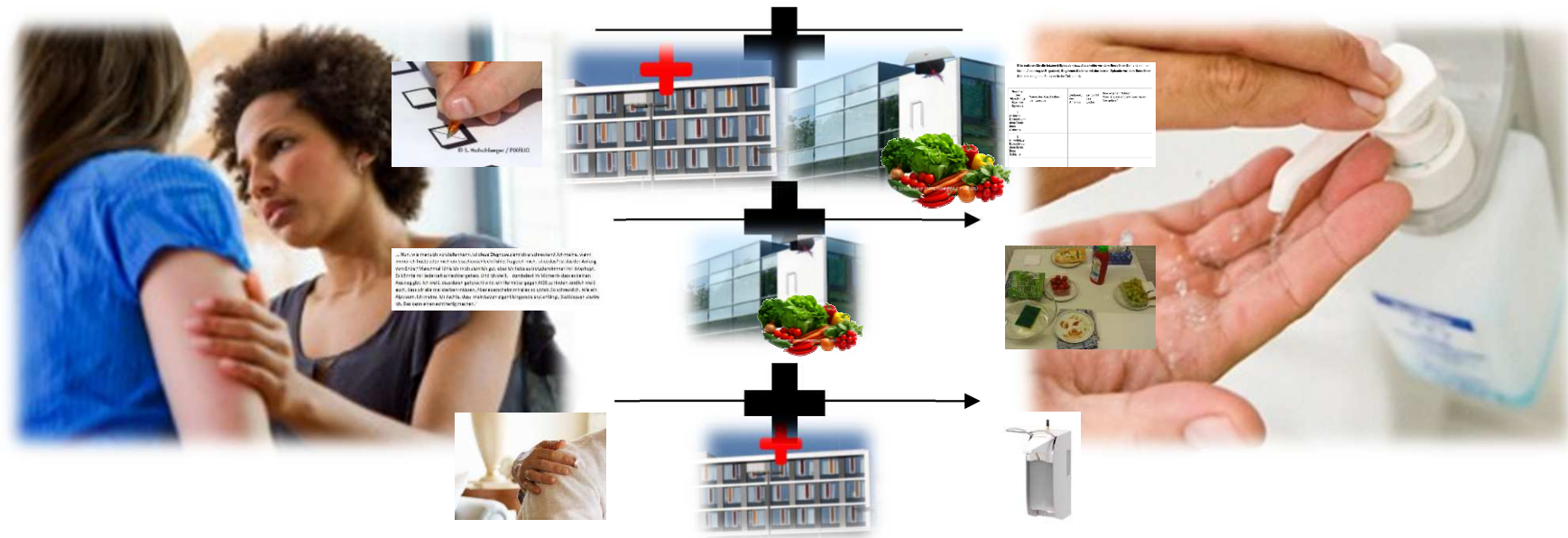$p = .004$, $_{part}\eta^2 = .30$

■ control
■ empathy

$p = .006$**

→ Decline in disinfectant usage reflects habituation to the new dispensers, which was more than compensated by the empathy manipulation
→ Effect of empathy manipulation on HH in real life

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# Summary & Discussion

## Empathy Study 1 to 4



- Empathy as interpersonal orientation not only affects phenomena of social interaction (e.g. helping behavior, Coke, Batson, & McDavis, 1978; prejudice, Batson, et al., 1997), but also hand hygiene behavior.

- Suggests new approaches for interventions to improve hospital HH and reduce nosocomial infections.

## What's next

**Plans/ideas for future studies**

- Differential influence of different types of empathy (PT, EC, PD)

- Levels of empathy of professional groups or specialities

- Develop and test more easy-to-implement empathy interventions

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# Introduction

**Theoretical approaches**

- HHH as **automatic behaviour**

    → implicit attitude towards hand hygiene (Diefenbacher, Sassenrath, Siegel, Grünewald & Keller, 2012), 2. habit (Diefenbacher, Pfattheicher & Keller, in preparation), implementation intentions

- HHH as (distant) **prosocial behaviour**

    →1. empathy (Sassenrath, Diefenbacher, Siegel, & Keller, 2016)

- HHH as **socially desirable behaviour**

    → social presence, norms

3. measuring HH

# Hand hygiene and habit

## Research question

**Habit** (Gardner, 2015; Verplanken & Orbell, 2003)
- stimulus-response-association
  ↳ situational cue
        ↳ behavioral impulse
      ! impulse ≠ execution

**Habit formation** (Verplanken & Orbell, 2003: 1314)
- "By **satisfactory repetition**, a behavior might become automatic (...)."
- "created by **frequently** and satisfactorily pairing the execution of an act in response to a specific cue"

**Hand hygiene**
- behavioral response (frequently) required in **specific situations**
- which situations?
  - hospital context: defined by indications e.g. before aseptic procedure such as opening a venous access line
  - daily live: defined by "indications" e.g. before eating
- situations provide **distinct situational cues**
  - venous access line, food

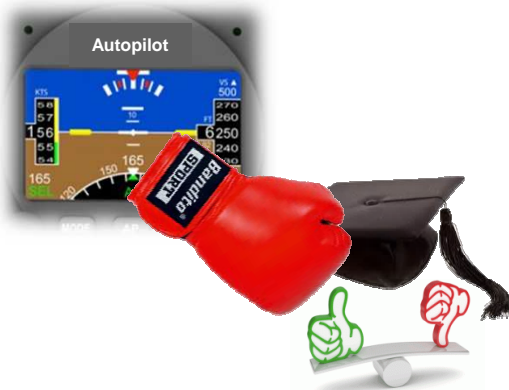Abteilung SOZIAL Psychologie

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# Hand hygiene and habit

## Research question

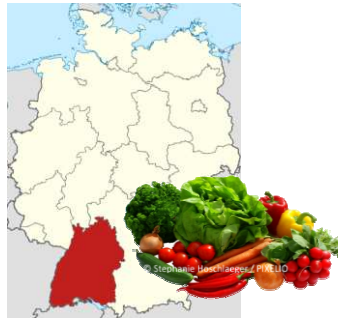**Hypothesis 1:** The stronger HH habit, the more HH behaviour.



**Hypothesis 2:** Habit is a more relevant predictor of HH than knowledge or attitude.

# Study 1 to 3 (food preparation)

## Methods - Overview

**n = 105** (w 80%, m 17%, $M_{age}$ = 24.9, $SD_{age}$ = 4.6, $Range_{age}$ = 18-47, Abitur 51%, abgeschl. Studium 48%)

**n = 128** (w 69%, m 31%, $M_{age}$ = 21.4, $SD_{age}$ = 5.2, $Range_{age}$ = 18-52)

out of this

**n = 55** (w 76%, m 24%, $M_{age}$ = 21.2, $SD_{age}$ = 4.4, $Range_{age}$ = 18-48)

Self-Report Behavioral Automaticity Index (Gardner, Abraham, Lally, & de Bruijn, 2012 *Int J Behav Nutr Phy*), sample item "Hand washing [hand disinfection] is something I do automatically."

Study 1 & 2: DRM-based self-report (Kahneman et al., 2004)

Study 3: Direct observation during food preparation (Sassenrath et al., 2016)

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## Study 1 to 3

### Results

Study 1: $r = .314$, $p = .001$

Study 2: $r = .307$, $p < .001$

Study 3: $r = .345$, $p = .010$
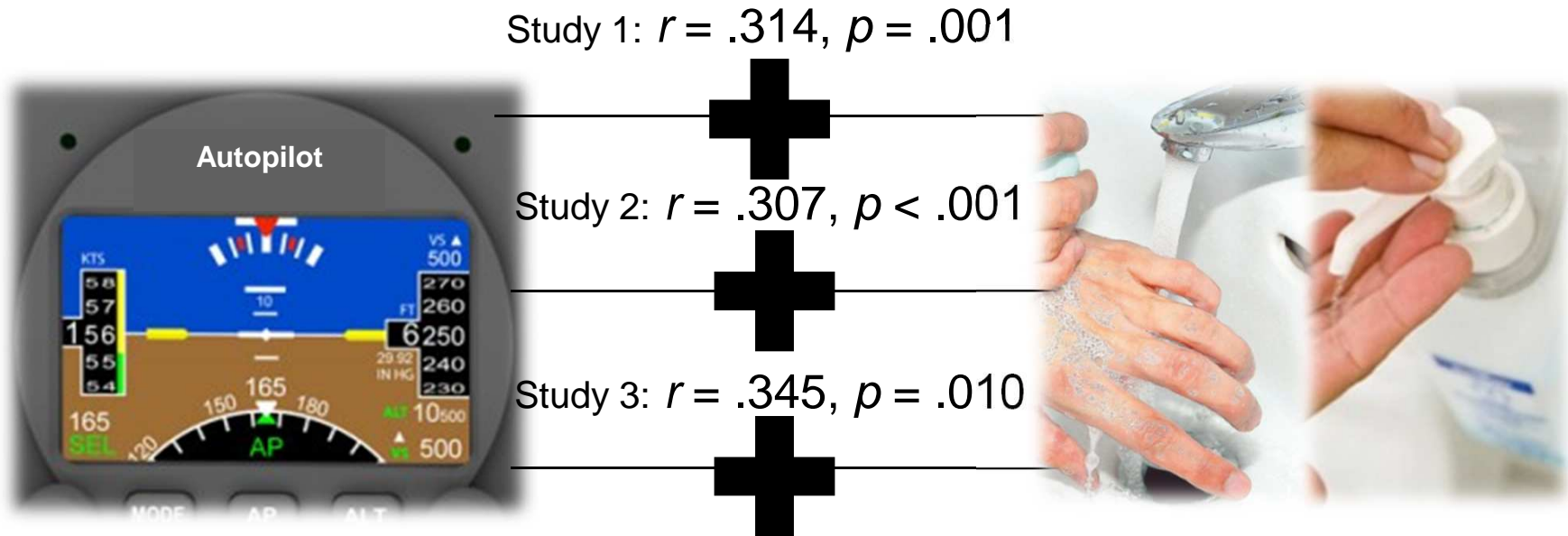
The expected positive relationship between hand hygiene habit and hand hygiene behavior (both self-reported and observed) was found in all studies.

# Studie 2 & 3

## Methods - Overview



**n = 128** (w 69%, m 31%, $M_{age}$ = 21.4, $SD_{age}$ = 5.2, $Range_{age}$ = 18-52)

out of this

**n = 55** (w 76%, m 24%, $M_{age}$ = 21.2, $SD_{age}$ = 4.4, $Range_{age}$ = 18-48)

SRBAI (Gardner, Abraham, Lally, & de Bruijn, 2012)

DRM (Kahneman, et al., 2004)

Explicit attitude towards HH (expactancy*value-score towards different possible consequences of HH (Ajzen & Fishbein, 1963; 1967; 2000)

# Results

| Study 2 | | b | SE | beta | t | p |
|---|---|---|---|---|---|---|
| **Model 1** | (constant) | 5.67 | 2.04 | | 2.78 | <.01 |
| *Korr. $R^2$ = .06,* *$F(1,126)$ = 8.62, $p$ < .01* | attitude | .20 | .07 | .25 | 2.94 | <.01 |
| **Model 2** | (constant) | 1.47 | 2.61 | | .56 | .58 |
| *Korr. $R^2$ = .09,* *$F(2,125)$ = 6.24, $p$ = .01* | attitude | .12 | .08 | .15 | 1.55 | .12 |
| | habit | 1.28 | .51 | .24 | 2.50 | .01 |

→ positive relationship between explicit attitude towards HH and HH (DRM)

→ after controlling for habit no longer significant

| Study 3 | | b | SE | beta | t | p |
|---|---|---|---|---|---|---|
| **Model 1** | (constant) | 1.72 | .79 | | 2.18 | .03 |
| *Korr. $R^2$ = -.02,* *$F(1,53)$ = .11, $p$ = .74* | attitude | .01 | .03 | .05 | .33 | .74 |

→ No relationship between explicit attitude towards HH and HH (observed)

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# Study 4: Field study

## Methods - Overview

**n = 71**
(w 72%, m 27%, $M_{\text{years at job}}$ = 13.5, $SD_{\text{years at job}}$ = 11.8, $\text{Range}_{\text{years at job}}$ : 0-36)

### Self-Report Behavioral Automaticity Index
(Gardner, Abraham, Lally, & de Bruijn, 2012)

### Knowledge, single-item, „I exactly know the recommendations on hand hygiene."

### Video-based observation in standardized patient situation

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## Study 4

**Results**



$\beta = .268^*, p = .024$

Positive relationship replicated for hospital context.

$\beta = .231^\dagger, p = .052$

$\beta = .248^*, p = .035$

$\beta = .206^\dagger, p = .077$

Habit is a stronger "predictor" for hand hygiene compliance than knowledge.

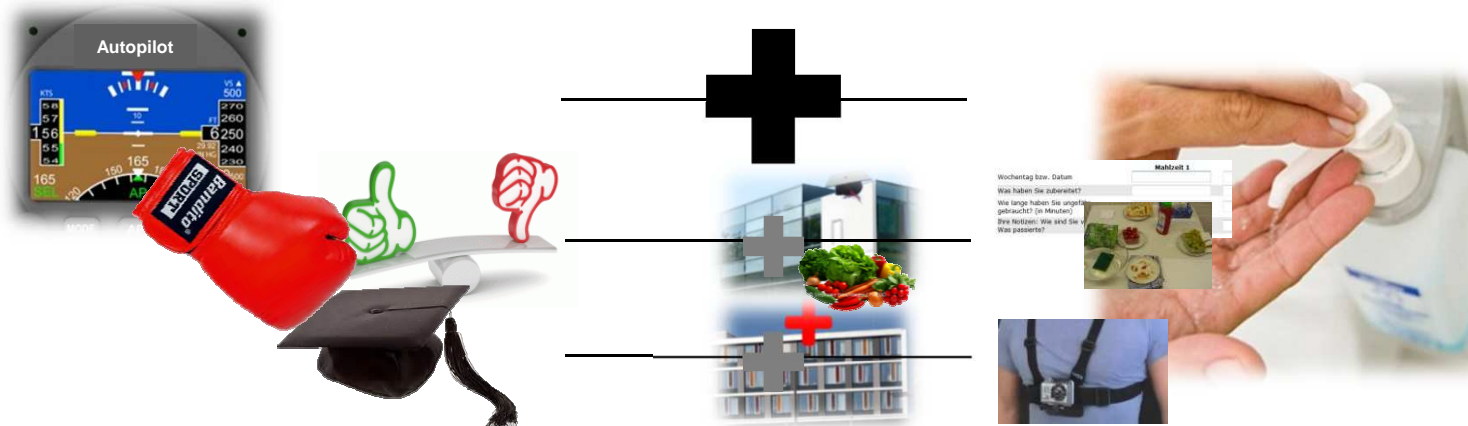Abteilung SOZIAL Psychologie

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## Summary

**Hypothesis 1:** The stronger HH habit, the more HH behaviour.
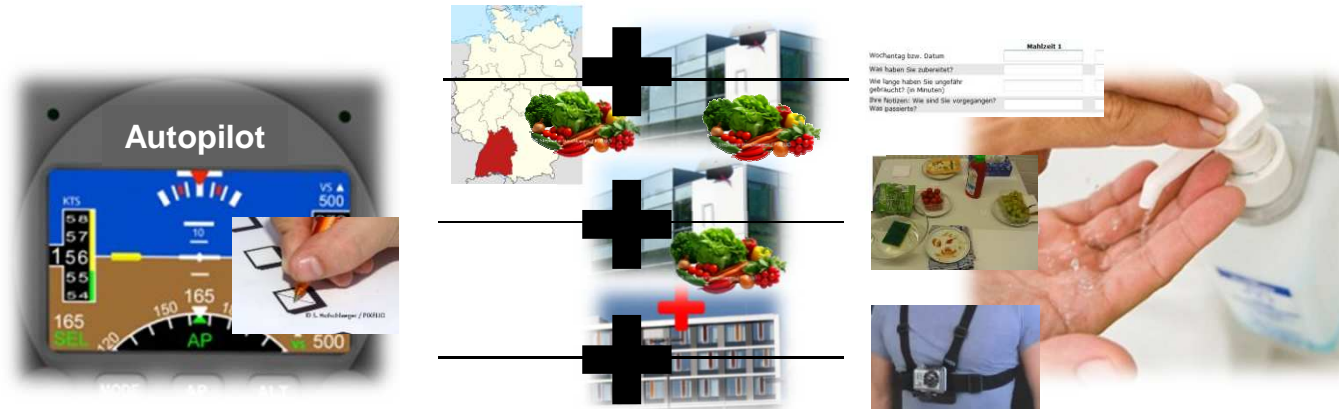


**Hypothesis 2:** Habit is a more relevant predictor of HH than knowledge or attitude.

# Discussion

## Habit and hand hygiene

## The role of habit

- **Positive relationship** between habit and HH established for food preparation and hospital setting AND habit was more „predictive" than knowledge or attitude.
- Open question: Role of knowledge/explicit attitude in habit formation? Differences between subjective and objective knowledge?

## Planned or automatic behaviour?

- The results indicate that HH should be targeted as **automatic behaviour** (not only as planned behavior).
- Benefit: Automatic behaviour is effortless/less effortfull.

## Practical implications

- Re-think the design of educational strategies on HH in hospitals.

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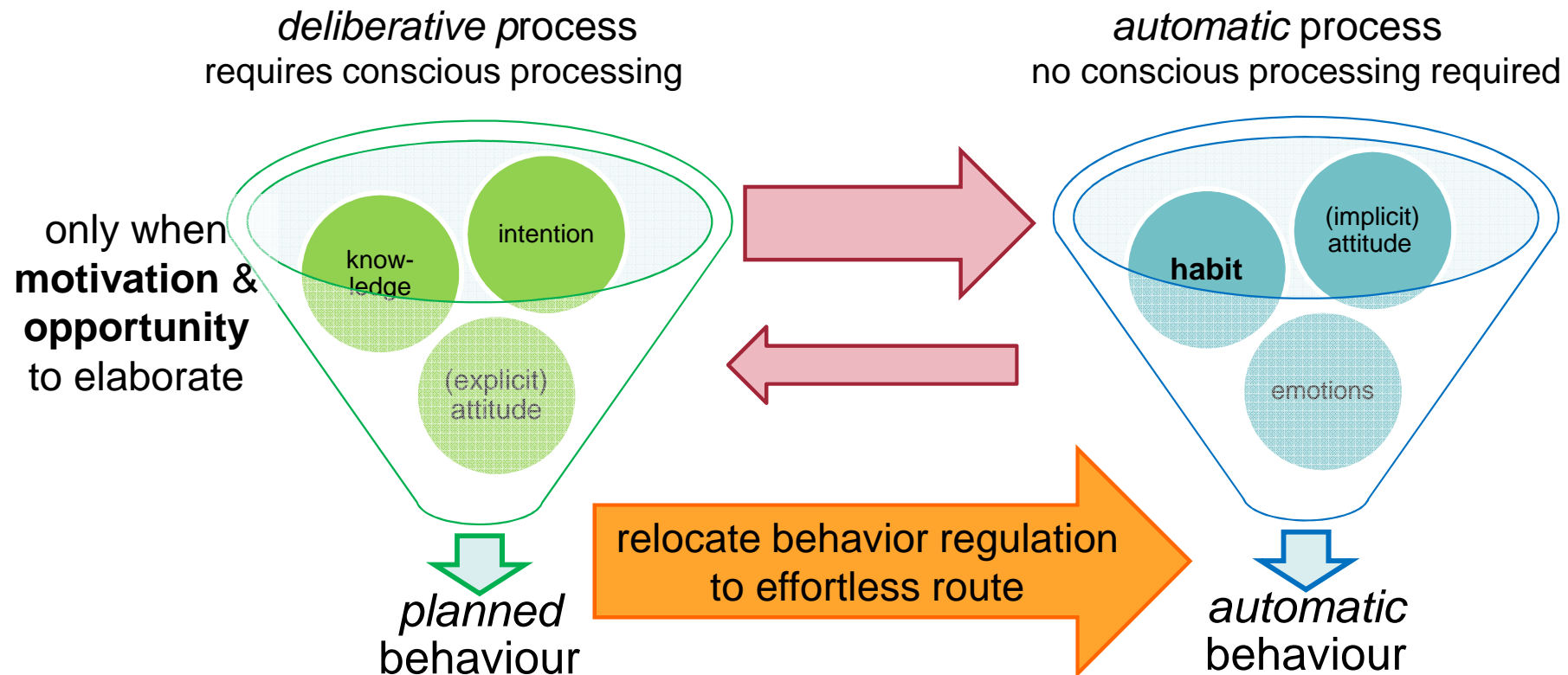
# What's next

**Plans/ideas for future studies**

- Measurement of habit:

  – stimulus-response-association → How to include situational cues?

  – RT-based?

- How to foster (indication specific) hand hygiene habit?

  – repetition?

  – conditioning?

- Design and test interventions to promote HH habit

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# General discussion

## Two process models of behavior regulation (Diefenbacher et al., 2012; Fazio et al., 1995; Metcalfe & Mischel, 1999; Strack & Deutsch, 2004; 2012; Wood & Rünger, 2016)



*deliberative* process
requires conscious processing

*automatic* process
no conscious processing required

only when
**motivation** &
**opportunity**
to elaborate

know-ledge

intention

(explicit) attitude

habit

(implicit) attitude

emotions

relocate behavior regulation
to effortless route

*planned* behaviour

*automatic* behaviour

## General discussion

**Back to the beginning…**

| Problem: | Solution: | Problem: | Solution: |
|----------|-----------|----------|-----------|
| HAIs | hand hygiene | low compliance | ? |

**knowledge-based strategies**
adressing the deliberative process

MRSA

VRE

Antibiotics

**additional strategies**
adressing the automatic process

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## Introduction

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- HHH as (distant) **prosocial behaviour**

  →1. empathy (Sassenrath, Diefenbacher, Siegel, & Keller, 2016)

- HHH as **socially desirable behaviour**

  → social presence, norms

3. measuring HH

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# HH compliance and HH frequency

## …and how to measure them

- **HH compliance**: balancing *actually performed* HH with HH that *should* be performed (according to HH indications) (Kampf & Löffler, 2007)

$$HHC\ (in\ \%) = \frac{HH\ actions}{HH\ opportunities} * 100$$

- **Direct observation** (by trained observers) as gold standard (WHO, 2009)

  - But: Very cost and labour intensive, validity problems (e.g. observer bias, sampling biases, perception and processing biases) (Diefenbacher et al., 2016; Haas & Larson, 2007; Marra et al., 2010; Pittet et al., 2004; Steed, 2011)

→ **Is HH compliance always necessary?**

- For some research questions mere HH frequency is enough (i.e. indications not taken into account) (Diefenbacher et al., 2016)

→ **How to overcome validity problems?**

- Video observation using body-worn cameras (Diefenbacher et al., 2016)

# DRM-measure of hand hygiene frequency

## Hospital and every day context

### Episode-diary

Bitte notieren Sie **die letzten 6 Episoden bzw. Abschnitte vor dem Ende Ihrer Schicht** an Ihrem letzten Arbeitstag (z.B. gestern). **Beginnen Sie bitte mit der letzten Episode vor dem Ende Ihrer Schicht** und gehen Sie dann in der Zeit zurück.

| Nummer des Abschnitts bzw. der Episode | Name des Abschnittes / der Episode | Zeitpunkt des Anfangs | Zeitpunkt des Endes | Ihre eigenen Notizen: Was ist passiert bzw. was haben Sie getan? |
|---|---|---|---|---|
| **1** (= letzte Episode vor dem Ende Ihrer Schicht) | | | | |
| **2** (= vorletzte Episode vor dem Ende Ihrer Schicht) | | | | |
| **3** | | | | |

### Task list

Geben Sie bitte so genau wie möglich an, welche Tätigkeiten Sie **in der Episode bzw. dem Abschnitt Nummer 1 vor dem Ende Ihrer Schicht** ausgeführt haben. Kreuzen Sie dazu bitte die Spalte rechts in der Tabelle an, wenn Sie die genannte Tätigkeit in der relevanten Episode bzw. in dem Abschnitt ausgeübt haben:

| | |
|---|---|
| Dokumentation / Außendienst/Organisation | |
| Verbandswechsel | |
| Blutabnahme bzw. Injektionen verabreicht | |
| Medikamentenausgabe bzw. Verabreichung (oral) | |
| Händedesinfektion (mit Sterillium oder ähnlichen Desinfektionsmitteln) | |
| Gespräche (z.B. mit Kollegen, Ärzten, Patienten, Angehörigen) | |
| Vitalzeichenkontrolle | |
| Essen verteilt/ Hilfe bei Nahrungsaufnahme | |
| Begleitung/ Transport von Patienten | |
| Hilfe bei Ausscheidung(auch Verabreichung von Einlauf) | |
| Legen von Dauerkatheter/Magensonde | |
| Infusion angehängt/umgesteckt/Systemwechsel | |
| Hände waschen (mit Wasser und Seife) | |
| Körperpflege (Waschen, Rasur, etc.) | |
| Urinbeutel/Drainagen/AP-Beutel geleert | |
| Trachealsonde abgesaugt | |
| Assistenz bei ärztlichen Tätigkeiten | |
| Lagerung bzw. Mobilisation von Patienten | |
| Sonstiges: | |

Setting 1: Hand hygiene in 6 work episodes
→ Number of episodes with hand disinfection

Setting 2: Hand hygiene in 3 episodes of private food preparation + hand hygiene frequency
→ Frequency of hand washing in all episodes

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# Direct (covert) observation of HH

**During food preparation, elderly home scenario**

Typical tasks in the context of food preparation in an elderly home

- Participants informed that HH is important in this context

- Visible disinfectant dispenser

- Registration of hand disinfection by experimenter

1. Wash a dirty plate.

2. Decorate salad on the washed plate.

3. Write three seat reservation cards.

4. Decorate a plate with cheese.

5. Test the smell of the cheese, blow nose beforehand.

6. Decorate a plate with fruits and biscuits.

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# Automatic registration of dispenser usage

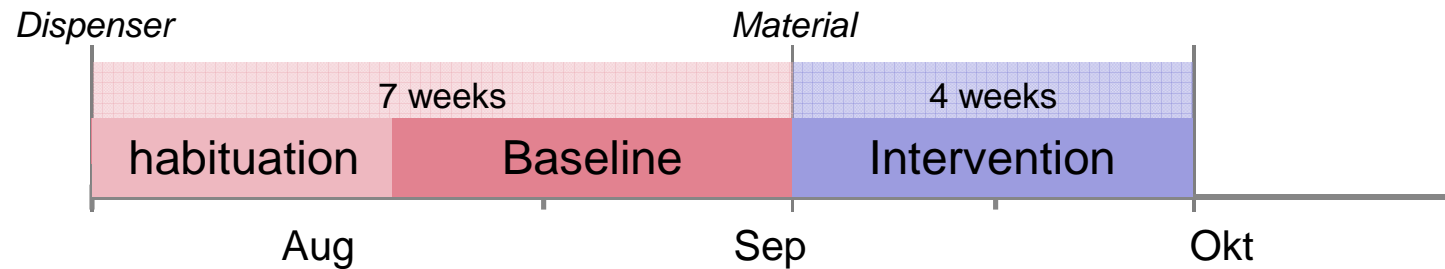**No visible counter**

ingo-man® Weco

| 1 2 3 | Integrated counter to measure hand hygiene behaviour |

Fully automated data transfer ("WiFi") to an analysis tool

→ Mean activation per day and study phase

*Dispenser*                                              *Material*

| 7 weeks | 4 weeks |
| habituation | Baseline | Intervention |

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# Video observation of HHC

**by body-worn camera during standardized patient situation**

- data recording
  - standardized patient situation with peripheral venous access port
  - chest-worn small-sized camera (action camera)

## Video observation of HHC

**by body-worn camera during standardized patient situation**

- data analysis
  - definition of standard operational procedure (SOP) in cooperation with clinical hygiene team with seven standard indications
  - coding of standard indications and corresponding HH actions by two independent raters (consultation with third rater to solve disagreement)
  - HHC in standard indications (all five WHO-indications included)

  - alternative: full coding of video material
    - coding of all indications (i.e. irrespective of SOP) and all HH actions
    - overall HHC

# What's next

**Plans/ideas for future studies**

- Compare different methods:

  - DRM with observation (direct and/or video)

  - Video observation with product use/dispenser activation/direct observation

  - Dispenser activation with observation (direct and/or video)

- Test feasibility of video observation in hospital day-to-day routine?

- Develop means to reduce concerns about privacy

- Promote the notion that the choice how to assess HH should depend on the research question

# Thank you!

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