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Can Motivational Operations Explain Nudging?

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## **Abstract**

Healthcare-associated infections affects hundreds of millions of patients worldwide every year. Most of these infections are preventable. Hospital visitors interact with the same patients as health personnel a can be carriers of infections. This study was a conceptual replication of a Danish study that increased hospital visitor's use of hand disinfectant from 3 percent to 67 percent. The replication study took place in Rikshospitalet University hospital with N=390 over a three-week period.

The nudges were based on following principles from behavioral economics; make it easy, attract attention, use social norms and find the best timing. Nudge 1 was the placement of a free-standing hand sanitizer next to a hospital ward, nudge 2 and nudge 3 had a red sign placed on the top of the hand sanitizer with a descriptive normative or an injunctive normative message. The result for Nudge 1 was 7 percent compliance, for Nudge 2; 46 percent compliance and for nudge 3; 40 percent compliance. The study confirms that nudges can improve hospital visitors hand hygiene compliance. The study is important because it can help prevent suffering and deaths caused by hospital infections.

The results of this study indicate that it is not enough to make a good choice easily available and timely when it is unable to attract attention and communicate a message.

## **Abstract**

When Thaler & Sunstein published their book “Nudge” in 2009 they started a revolution based on the principles of behavioral economics. National behavioral teams were launched with the mission to simplify public sector and design a more human friendly policy.

A nudge is an environmental stimulus designed with the purpose to increase the selective power of a choice situation in order to make it easier for people to take good decisions.

Motivational operations (MO) changes the environment that influences and alters the reinforcing effectiveness of a stimulus. Both nudges and MO can change the value and perspective of a stimulus by redesigning the context around it. Nudges and MO’s might seem to be the same, but they are different in many ways.

While nudges preserve freedom of choice and, a MO has no limitations to its scope. Nudges are defined by their intended effect on behavior and a MO is defined by its functional effect on behavior. This article discusses different areas of policy making were MO’s can explain nudging and which nudges that are not compatible with MO.

## **Can motivational operations explain nudging?**

*“I do not believe that organisms ever misbehave. I long ago adopted the basic rule in animal research that the organism is always right. It does what it is induced to do by genetic endowment or the prevailing conditions”*

(B. Skinner, 1977, p. 1007).

Adam Smith (Angner, 2012) published his work; “Wealth of Nations” in 1776. He drew his understanding of behavior from hedonistic psychology which states that human conduct, and especially human behavior is fundamentally motivated by the pursuit of pleasure or the avoidance of pain. Smith’s theory became the cornerstone from which classical economic theory was built upon and laid the ground for how predictions of human behavior was made. The theory was conceived as a normative model of an idealized decision maker and not as a description of the behavior of real people (Tversky & Kahneman, 1989). Classical economic theory has evolved to be an elegant theory with a huge influence on society, this include law and economics and politics among others (Etzioni, 2011). The theory assumes that people are in possession of unlimited rationality and unlimited self-control with the sole purpose of maximizing utility and minimize pain (Angner, 2012). Classical economic theory is context independent in order to make universal predictions. It pretends that context is irrelevant and assumes that people have a consistent and constant way of thinking about value (Shah, Shafir, & Mullainathan, 2015; Sutherland, 2019). It has to a great extent disregarded the importance of the environment and rather focused on the human mind as the selector of behavior. Since the theory understands humans to be purely rational and able to optimize utility in any choice situation the solution to most problems would be more information (Angner, 2012).

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Herbert Simon (1955) argued that humans are only boundedly rational since total rationality would demand too much time and would put too much strain on a person's limited cognitive capacity. Instead of maximizing utility, humans satisfice, which means that they settle for a satisfying result. Simon explained how people use a set of mental shortcuts – called heuristics to make their decisions and were not calculating every option with a logical flawless mind as assumed by classical economic theory.

Tversky and Kahneman (1974) explored Simon's theories with a series of experiments – they investigated human decision making under uncertainty. Simon's arguments about bounded rationality were confirmed; people make choices based on a set of heuristics and many times would these heuristics cause severe biases. Richard Thaler (2015) noticed how his student of economics made choices that diverged from classical economic theory. Why would someone value a set of tickets differently if they were given for free or bought for an expensive price, the tickets were the same? Thaler wrote these “behavioral twerks” in a notebook; people were not doing as economic theory said that they should, they were misbehaving.

(Tversky & Kahneman, 1989) found that many of the deviations of actual behavior from the normative model were too widespread to be ignored, they were too systematic to be dismissed as random error, and they were too fundamental to be accommodated by relaxing the normative system. The field of behavioral economics has since unveiled many heuristics that lead to systematic mistakes. Research has been poured in to gather an understanding of how these heuristics work in order to neutralize expected biases by redesigning the choice architecture. Much value can be found in understanding how people behave in the reality rather than how they should behave according to the classical economic theory (Kahneman, 2003; Sutherland, 2019).

The environment we interact with on a daily basis has been designed on the principles of classical economic theory (Shah, Shafir, & Mullainathan, 2015). The environment is the

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selector of all behavior. Selection happens in the interaction between an organism and its environment where behavior is shaped and refined by their consequences. Behavioral consequences are everywhere; some are instant and frequent and causes immediate learning, some are colored by traditions in form of rules and social norms and others are so rare or far away in the future to have any effect on behavior. The outcome of human decision making is determined by their history of learning, their genetic make-up and the present selective forces in the choice context (Etzioni, 2011; Halpern, 2015; B. F. Skinner, 1953).

If behavior reflects the selective forces in an environment, then an environment that causes people to make predictable mistakes are in need of change.

Since people are not able to act according to the key assumptions of classical economics they need some help to find the best options (Etzioni, 2011). Nudges are small alterations in the context surrounding the choice situation designed to make it easier for people to make good decisions (Kahneman, 2011). The context around a choice situation that influences behavior is called motivational operations. Next, we will take a closer look at what motivational operations and nudges are.

### **Motivational Operations**

In the immediate environment surrounding a choice situation there are some extreme important variables that have an effect on behavior. These variables can be found when we study the structure of the world we see, hear, touch, smell and taste (B. F. Skinner, 1953). Human behavior can vary greatly depending on when it is presented with the same stimulus. Aging, temperature, tiredness, hunger, thirst and other operations can influence and motivate behavior (B. F. Skinner, 1938). Changes in the context and environment of a stimulus that alters behavior is called motivational operations (MO). A MO changes the perspective and value of a stimulus and alters that stimulus' effectiveness as a reinforcer or punisher. It can influence every part of the decision-making context by acting on all three elements of the



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three-term contingency and determine what an individual wants at any given time.

Environmental-behavioral relationships are always conditional depending on other circumstances causing a MO to be both dynamic and changing (Michael, 1982). It is socially acceptable for a new born child to burp after a meal, but as the child grows older burping will not be accepted at the dinner table anymore (except in some Asian countries).

MOs can operate on every part of the three-term contingency. Just like behavior operates on its environment to change it a MO alters the value and perspective of a stimulus that has a directly impact on the behavior (Laraway, Snyckerski, Michael, & Poling, 2003).

Motivational operations occur in everyday life and depends on a person's conditioning history. A famous song might trigger great memories for a shopper and cause him or her to buy more of a certain product, another person might be reminded of a personal tragedy and hurry through the shop buying only the necessities. Likewise, an effective commercial can alter the reinforcing value of a product and increase the likelihood of someone purchasing it. The behavior altering effect of a MO is usually learned (culture, social norms, certain rules). From a behavioral perspective the person does not have to understand anything for a MO to have a value-altering or behavior altering effect (Pierce & Cheney, 2008). A MO can be an environmental event, condition or a stimulus condition that affects an organisms behavior (Cooper, Heron, & Heward, 2007; Michael, 1993).

Physiological, emotional and psychological conditions can strongly influence the value and the perspective of a stimulus as a reinforcer. A visit to the doctors' surgery is not usually a very reinforcing event, but when we feel ill the value of a trip to the doctor changes radically. The reinforcing effectiveness of basic things like food, drink or sleep depends on the degree of deprivation or satiation that a person experiences at that particular moment. A hungry person will do almost anything for a meal causing the reinforcing effectiveness of food (MO) to increase radically. A MO can also decrease or increase and the punishing effectiveness of

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objects or events by making them unavailable or by removing them (Laraway et al., 2003).

M. Dougher (1995) describes three classes of events that alters the function of the three term contingency: (i) *Physiological conditions*; deprivation, satiation, illness or health, amount of rest, presence or absence of drugs, (ii) *durational events*; presence or absence of certain events, objects or persons, instructions or verbal statements, ambient noise or ambient temperature, (iii) *behavioral histories*; family interaction before arriving at work or school, previous experience with existing contingencies, the development of relevant behavioral repertoires.

A verbal MO is a rule-governed behavior. Rules can change the effectiveness of already established reinforcers. When someone says that he or she values something or someone, that statement refers to the effectiveness of that person or thing as a reinforcer for their behavior (Plumb, Steward, Dahl, & Lundgren, 2009).

The reinforcing effectiveness of a stimulus changes with changes in the environment. Our behavior changes with the weather, our location, social setting and other environmental events. Christmas carols and Christmas trees are popular in the festive season of December, when the New Year's celebration is over, satiation kicks in and everything Christmas like is packed away - until next December. An ice-cream might be a huge reinforcer on a warm summer day, but it might not have the same reinforcing effect after walking through a freezing blizzard. In the same way a stimulus can be a reinforcer in one situation and be a punisher in a different situation – it all depends on the context in which a stimulus is presented. A meal at a Michelin three-star restaurant would be a treat for most people, but a sewage leak next door would definitely ruin the whole experience.

There is a truth in the old saying that: When the cat is away the mice are dancing on the table. Our behavior changes with the context around us.

Behavioral analytic terms are always defined by their effect on behavior. Any attempt

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to change the context without altering behavior is not a MO; a MO will always have an impact on behavior (B. F. Skinner, 1938).

### **Nudging**

A nudge is an environmental stimulus designed with the purpose to improve the selective power of a choice situation. As mentioned earlier, the context in which decisions are made has been designed with the subject in mind that people are rational actors. When people time and time again make mistakes and do not act according to the rationale of classical economic theory, small nudges in the environment can help to steer people in the right direction (P.G. Hansen, 2015).

*“A nudge is any aspect of the choice architecture that alters people’s behavior in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting fruit at eye level counts as a nudge. Banning junk food does not” (Thaler & Sunstein, 2009, p. 6).*

Nudging as a tool for behavioral change has become more and more popular. Governments around the world have established behavioral teams with a mission to simplify and redesigning policies in order to make them easier for people to maneuver in (Halpern, 2015).

Nudges are ways to make it easy for people to think or want to do certain things, they are liberty preserving approaches that lead people in particular directions (Pelle Guldborg Hansen & Jespersen, 2013). Nudges are not attempts to change people’s values system or increase information provision; instead it focuses on enabling behaviors and personal decisions that are good for the individual and also good for the society (Mont, Lehner, & Heiskanen, 2017).

**Libertarian paternalism.** Libertarian means that nudges have to maintain or increase

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someones freedom of choice without adding any negative burden when people choose to exercise their own freedom. The paternal part speaks of the attempt to influence people's choices in ways that will make their lives longer, healthier, and better; as judged by themselves.

Sometimes the use of default rules, simplification, and uses of social norms can have a larger impact on behavior than economic incentives. Some nudges work because they make information more understandable, others make choices easier and others work because of the power of inertia and procrastination. A substantial economic incentive is not a nudge, a tax is not a nudge, a fine or jail sentence is not a nudge; a nudge must always preserve freedom of choice (Cass R Sunstein, 2018).

### **When do we need a nudge?**

**Separation in time.** Choices and their consequences can sometimes be separated in time and have delayed effects. Smoking, alcohol and excessive eating might give us a pleasure now but the consequences will catch up with us later.

**Lack of frequency.** Some of the most important decisions we make in do not provide an opportunity for us to practice and learn. Learning is difficult in complex and infrequent situations such as the choice of which college to attend, which spouse to choose and what career we are to pursuit. When we are young the thought of putting money aside for retirement might not seem as important as a flashing new car, but as we are starting to age the consequences of not saving for retirement can be devastating. The higher the stakes, the less often we get an opportunity to practice and learn.

**Unclear feedback.** Consequences and feedback need to be immediate and clear to give us an opportunity for learning. But in some situations, there is no feedback available or the relationship between choice and outcome can be ambiguous. Some long-term processes do not give us feedback before it is too late; an unhealthy lifestyle might trigger severe health

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problems later in life (Halpern, 2015; Mont et al., 2017; Thaler & Sunstein, 2009).

A nudge changes the presentation of choices in a way that makes it more likely for people to choose the option that benefits them. They make it easy for people to think or do certain things by making it compatible with their values and desires (Kahneman, 2013). The environment or context in which choices are presented has a huge impact on human behavior. Choice architecture means to design environmental nudges to make it easier for people to make good decisions in a complex environment (Rick & Loewenstein, 2008). A nudge can be compared to a GPS; it guides people in a particular direction and also allow them to go their own way. Nudges are designed in the interest of choosers or society as a whole (Cass R. Sunstein, 2017; Cass R Sunstein, 2018).

We have discussed some features of motivational operations and nudging. We will now take a closer look at the similarities and differences between MO and nudging and investigate to what degree motivational operations can explain nudging.

### **Context and choice architecture**

The context strongly influences a behaviors outcome and consequence and determine how we understand and respond to stimuli and choices (A. Charles Catania, 2001). Environments consists of objects that each are associated with a criterion to be predicted and a number of cues that may be helpful in predicting it. To understand how people make decisions one needs to analyze the texture of the environment, past and present (Gigerenzer & Todd, 1999). An understanding of behavior as a function of its environment means that we can influence and change behavior by altering or construct certain variables in the environment (Rick & Loewenstein, 2008). Peoples preferences are often malleable and framed by normative irrational contextual features making it possible for small changes in the environment to have a huge impact on behavior (Shah et al., 2015).

Mont et al. (2017) have identified eight aspects of policy making being used to

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influence behavior. The first four instruments are mostly drawn from the idea of the rational man and are (1) laws and regulations, fiscal tools like (2) taxes and (3) subsidies, and (4) information that enable individuals to make informed choices. The next four types of policy instruments come under the umbrella of nudging; (5) simplification and framing of information, (6) changes to physical environment, (7) changes to default policy and (8) the use of social norms. The four nudges make up a tool kit used by behavioral teams to organize the context and make it easier for people to make good choices (Thaler & Sunstein, 2009).

### **Simplification and framing of information**

Framing is to select parts of reality and making it more salient in order to promote a certain reaction. It is to consciously angle information in a way that activates certain values and attitudes (Mont et al., 2017). It matters how information is provided. The complexity of information greatly affects the outcome of the decisions that people make (Thaler & Sunstein, 2009). If you ask people if they are in favor of more public regulations, most will answer no. But if people are asked if they want to maintain or strengthen regulations in order to protect safe workplaces, safe food, and clean air, most will answer yes (Cass R. Sunstein, 2013). Framing of decisions depends on the presentation of choice, how the choices are displayed and the context in which choices are made. Decisions are controlled by the manner in which choices are presented as well as by norms, habits, and expectancies of the decision maker (Tversky & Kahneman, 1989). Simplification of energy labels has made key information of how much energy an item consumes easier for customers to understand and thereby made it easier to make informed choices.

It is possible to frame a choice situation in more than one way. By reframing the situation, the perspective of the relative apparent size of objects and the relative desirability of options can be changed. In this way can different frames can lead to different choices (Tversky & Kahneman, 1981). Objectively equivalent information can result in different judgements and

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decisions depending on the way that information is labeled or “framed”. The appeal of public policy can greatly alter its appeal by framing the consequences in positive or negative terms (Tversky & Kahneman, 1989). Nudges can simplify and frame complex information to make key information more salient (Mont et al., 2017).

History has provided us with many great examples of the effect of framing information, here is a couple of examples:

**The Potato King.** In the 1700’s there were numerous famines in Europe that killed hundreds of thousands of people Over 40 percent of the population in East Prussia starved to death in a famine between 1705-1711. King Frederick II of Prussia (1740-1786) did something about it. During a famine in 1774 he commanded that potatoes should be grown for consumption, and that it would be severe consequences for those who did not obey. People refused to obey and in some places they actively rebelled - they did not like the potato and neither did their livestock. When coercion didn’t work the king decided to rebrand the potatoes. He created a Royal Potato Field with armed guards around it. People’s mindset towards the potato changed, if the king put so many heavily armed guards around the field, it must be something worth stealing and that’s what they did. The guards were instructed to pretend that they did not see the “potato-thieves”. Potatoes were sold on the black market and eventually people started to plant and grow potatoes in their fields and gardens (Sack, 2013; Wright, 2016).

**Captain Cook and sauerkraut.** Scurvy, “the plague of the sea”, killed more than two million sailors during the Age of Sail (1500-1800). Far more sailors died from scurvy than all other diseases combined, including deaths from combat, storms, disasters, and shipwrecks. When captain Cook set sails, he didn’t know the cure or cause of scurvy, but he knew that the nutrient-rich pickled cabbage seemed to help the disease. He brought several tons of it on his voyages together with fresh fruits. His only problem was to get his sailors to eat it. To trick them, Cook had sauerkraut served only at the officers table. When the sailors saw their

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officers eating it they thought it to be a delicacy and asked to be served some for themselves, after three years at sea none the sailors died from scurvy (Andrews, 2015).

These are good examples of how rules can change the reinforcing effectiveness of a stimulus by transforming the psychological functions of its environment. Motivational operations, in the form of verbal rules, changes the value and effectiveness of a stimulus as a reinforcer making framing and simplification a MO (Plumb et al., 2009). Framing has the same function as an effective commercial and alters the reinforcing value of a product (Pierce & Cheney, 2008). The king and the captain changed the value of potatoes and sauerkraut and caused a demand for the products. In the language of nudging these examples can be understood as a framing of information (Kahneman, 2013).

### **Changes to the physical environment.**

The physical environment has a significant impact on human behavior. It is in the interrelation with the environment that behavior is changed (B. F. Skinner, 1969). Choice architects design nudges in the environmental to make it easier for people to make good decisions by making preferable options more convenient (Rick & Loewenstein, 2008). People use contextual cues to interpret everything from color to size to value and their judgements changes with the context.

Small changes in the physical environment can have a huge effect on people's choices. People are influenced by changes in the layouts and functions of a context (Mont et al., 2017) When shops place fruit close to the cashier and within easy in reach of the their customers, customers will buy more fruits than chocolates and vice versa (Thaler & Sunstein, 2009). Both smell and sound can have an impact on the emotional state of people in a retail setting, and thereby influencing their shopping choices. The smell of newly baked pastry can impact what we put in a shopping basket. A shop played French music in the background and the sales of French wine increased and when German music was playing in the background the



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sales of German wines increased (Thaler & Sunstein, 2009). When 90 Nordic Choice hotels changed their plate size from 24 to 21 cm it caused a reduction in food waste among guests with 19,5 percent (Kallbekken & Sælen, 2013). The director of food services for hundreds of schools in the US run some experiments to determine if the way food was displayed and arranged had any influence of the food choices that kids made. In some schools' desert was placed first, in other schools last. By rearranging the order of food the increase or decrease of many food items were as much as 25 percent (Thaler & Sunstein, 2009). In the early 1920s, when the number of cars started to increase, a new problem arose - car crashes. As cars were able to drive faster the drivers would cut the corners and hit cars coming the other way. The solution was to paint a white line in the middle of the road, a solution that proved to be very effective (Halpern, 2015). Changes in the physical environment can be to introduce color, objects or events to attract people's attention. It can be to remove or add friction in order to increase or decrease behavior; the introduction of speedbumps, or sleeping policemen, have been effective to reduce speed in dense populated areas (Halpern, 2015).

Environmental events, operations or stimulus conditions that affects and influences the reinforcing effectiveness of an event that causing the frequency of a behavior to increase or decrease is a MO (Michael, 1993). Any change in the context that changes the reinforcing effectiveness of a object, event or person is a MO. Any change to the context that alter behavior in a predictable way counts as a nudge (Thaler & Sunstein, 2009).

Sometimes changes to the physical environment have no affect human behavior, several kinds of contextual effects can be reduced or eliminated by scarcity and bring decision making closer to normative predictions. It may not change the fact that value assigned to a certain object depends on contextual cues, but it change the cues that people consult (Shah et al., 2015). In other words, behavior that is under the control of rules and verbal behavior can sometimes be partly immune to contextual changes (A. C. Catania, 1995).

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### **Changes to default policy**

People have a tendency to take the path of least resistance when it is possible. Default options have great influence on outcomes since people we often procrastinate or do nothing unless they have to. Default options determine the outcome of a decision when it is left to status quo (Mont et al., 2017). The organ donation consent rate in Austria is over 99 percent, while in Germany the rate is just 12 percent. The main reason for the difference between the two nations is the different in default rules. Organ donation is the default rule in Austria and not in Germany and a consequence of the default heuristic and of the legal environment leading to the striking contrasts between the countries (Gigerenzer & Todd, 1999; Cass R. Sunstein, 2013).

Policymakers had for a long time been struggling with the issue of how to get more workers to save for pension. They offered huge subsidies but for some reason it seemed like people were not interested in retirement saving. The default option of retirement savings in large UK companies were flipped in 2012; workers were now automatically enrolled into their company's pension plan instead of actively having to choose to join a pension scheme. Within six months more than a million new workers were saving for pension. The number of workers of large companies saving from pension increased from over 60 percent to over 80 percent (Halpern, 2015).

The National Lunch Program in USA ensured that all children in public and non-profit schools would be offered low-cost lunches. Those at or near the poverty line did not have to pay anything. The problem was that numerous eligible children were not enrolled in the program because their parents did not apply for it. The default was changed so that children were automatically enrolled in the program and the number of children receiving free lunches increased from 31 million to hundreds of million (Cass R. Sunstein, 2013).

People tend to procrastinate or avoid a choice that doesn't seem urgent and continue with the

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status quo. Changes to the default option makes it easy for people to do the things they would like to do if choices were more straightforward, it helps people to achieve better results (Halpern, 2015).

The consequences of important choices, like saving for retirement and organ donation seems to be too far away in the future to matter for the present. Motivational operations act on all three elements of the three-term contingency (M. J. Dougher & Hackbert, 2000). It changes the value and perspective of a choice and influence not just behavior but the whole three term contingency. Changes to default policies (presumed consent) assumes that no active choice behavior will take place, but it changes the consequences of not doing anything. Changes to default policies can reinforces passivity and the absence of responding. Changes to the default option is a powerful nudge, and a clever way to alter the consequences of inertia. A MO changes the reinforcing effectiveness of an environmental event, but a MO and a consequence is not the same thing. "Changes to the default option is to change the consequence of inertia and procrastination and it is not a MO (Michael, 1993).

### **Use of social norms**

Humans are social beings and we are greatly affected and influenced by what other people are doing. Social influences like interpersonal contacts and community play an important role in shaping people's behavior (Cialdini & Goldstein, 2004). Sometimes it is enough just to inform a person about what others are doing to influence and change that persons behavior. Goldstein, Cialdini, and Griskevicius (2008) used social norms to change the reuse rates of towels among hotel guests. They placed the text "the majority of guests reuse their towels" in bathrooms and this produced significantly better results than information that only focused on environmental protection. People compare themselves to others and look for social cues of behavior in unfamiliar or new situations. If a crowd is gazing in a direction it is almost impossible not to follow the gaze of the crowd. And if

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everyone around us is running away screaming, it's probably smart for us to do the same too. We eat more when we dine with many than with few. If we dine with someone that is eating big portions, eat more too and if we dine with someone who eat smaller portions, we tend to do the same too; we mirror the behavior of people around us. The more we like someone or the more we respect them, the more we mirror their behavior (Halpern, 2015; Rimal & Real, 2005). Social learning is an important source of human learning; we learn by observing what other people are doing - making it possible for social influences and cultures spread through entire organizations and even nations (Bandura & Walters, 1977; Cialdini & Goldstein, 2004). Descriptive social norms are what most people actually do; most Norwegians brush their teeth twice a day. If someone don't brush their teeth twice a day and discover this, they may adjust their behavior. Prescriptive norms are actions people should do; they highlight behavior approved by most people. Exercise is a prescriptive norm, we all know that we should, and we have a general understanding of the important health benefits of regular exercise, but for a variety of reasons (many of them behavioral) we simply don't. When we observe what most people do in a social setting, we perceive, often correctly, that we are required to do the same. Many social norms draw their influence from people's perceptions of social approval and a desire to do the right thing. People do certain behaviors because they believe that people important to them expect them to do so and if they fail to do so it will result in social sanctions. (Rimal & Real, 2005).

**Conformity.** In the 1950s Asch (1955) conducted a series of experiments to investigate how peer pressure could influence peoples decisions. When people were asked to decide on their own, without any influence from others, they almost never answered wrong. But when everyone else gave an incorrect answer almost 75 percent agreed with the group, ignoring their own convictions.

Social norms have a strong influence on people's behavior. One of the great voices in

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marketing, Stuart Henderson Britt once said: “doing business without advertising is like winking to a girl in the dark. You know what you are doing but nobody else does” (Britt & Boyd, 1973; Cialdini & Goldstein, 2004). To make an impact on people’s behavior a social norm needs to be salient. An experiment conducted in an USA university campus showed how an attempt to encourage the use of stairs instead of an elevator, by putting up signs that explained how using the stairs was a good way to get exercise, didn’t work. Instead, a sign telling students that ‘most people use the stairs’ was very effective and increased stair use by 46 percent (Burger & Shelton, 2011). The Behavioural Insights Team (BIT) found that a messages stating: “Most people in your area have already paid their taxes, and you are one of the few that are late” increased the payback of taxes that people owed the government with 16 percent (Halpern, 2015).

Social norms can backfire. A public campaign saying that only 15 percent of students drop out of high school might actually discourage some student from graduating since they might have thought the drop-out rate to be lower (Johnson, 2019). Some people might be indifferent to general social norms and have their own definition of them causing the use of social norms to have no impact. Others might rebel against what they perceive as an attempt to control them with more mandates and bans (Cass R Sunstein, 2017). A social norm can be overruled by an individual’s own rule following when overt rules are not sensitive to contextual changes (as in pliance) and be rendered powerless (A. C. Catania, 1995).

We learn emotional responses by observing them in others, matching their behavior and experience the consequences for ourselves. Cognitive behavior that is influenced by the behavior of other individuals is a MO. People’s moral development is based on an extensive repertoire of acquired moral rules thus making morality a rule-governed behavior (Novak & Pelaez, 2004). Social cognition is described as “the way people select, interpret, remember and use social information to make judgements and decisions” (Aronson, Wilson, & Akert,

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2010, p. 83). If an augmental rule says that this is how to behave in order to fit in, achieve certain benefits or comply to social norms, it is a MO. Social norms that influence behavior can be explained as MO's as they can greatly increase or decrease the value and the effectiveness of both reinforcers and punishers.

### **Fiscal incentives**

The instruments such as tax reduction, incentives, grants and subsidies applied by the governments to support various activities of individuals and organizations

In 2001 the Norwegian government introduced lucrative incentives to promote the sale of electric cars in order to reduce pollution. Electric cars were excluded from taxation by the removal of VAT and annual road taxes, they were also given free passes through toll roads and free parking at public parking lots. For the first three years electric cars could also use the public transport lanes to avoid traffic stand stills. The sale of electric cars skyrocket and the incentive has been a huge success (Elbilforeningen, 2019). Fiscal incentives that alter the reinforcing effectiveness of an event, object or a situation is a MO.

### **Law and regulations**

The tobacco act of May 2004 banned all cigarette smoking from public places and smokers were sent outdoors on designated places to enjoy their cigarettes. The tobacco act had a huge influence on both short-term and long-term behavior. By making it more uncomfortable to smoke several smokers were motivated to quit their habit and less new smokers were recruited (Sørgjerd, 2014). Prior to the tobacco act non-smokers would let smokers enjoy their cigarettes in their homes and endure passive smoking. After the tobacco act the social norm for smoking changed, smokers were asked to go outside, and most people would not tolerate passive smoking anymore. The tobacco act can be seen as a MO with strong influence on behavior. It was regulated by law giving and fines and is therefore not a nudge.

### Summary and conclusion

Motivational operations are defined by their function in the environment and their effect on behavior. Nudges are defined by their purpose and intention. The definition provided by Thaler and Sunstein says that a nudge alters people's behavior in a predictable way, but ten years later when Sunstein (2017) discusses nudges that fail it becomes clear that for an environmental event to count as a nudge, it doesn't need to have a predictable effect on behavior. A nudge failing to influence a behavior is still a nudge, technically speaking. Nudges can be ineffective or less effective than expected (Thaler & Sunstein, 2009). A MO can be any part of public policy making that changes the value and perspective of a stimulus, whereas nudges are restricted to influence behavior without the help of aversive consequences, law giving or significant incentives (Mont et al., 2017).

Motivational operations are the context in which behavior is selected and the selecting force that determines the choices of an individual at any given time. Rule-governed behavior can be a MO's and sometimes rules override the sensitivity to nudges in an environment (A. C. Catania, 1995).

Motivational operations can explain how many nudges work; (1) *Simplification and framing of information* alters the reinforcing value of an event, object or situation and changes people's perception toward it. (2) *Changes to physical environment* alters the reinforcing or punishing effectiveness of an object, event or situation and changes the context in which choices are presented. (7) *The use of social norms* that has an influence behavior can be explained as MO's as they greatly increase or decrease the value and the effectiveness of both reinforcers and punishers.

*Changes to default policy* means to change the consequences of a decision when no active choice behavior is assumed to take place. Consequences are an important part of the three-term contingency and can be affected by MO's, but a consequence is not the same as a MO.

## Can Motivational Operations Explain Nudging?

Some nudges influence the targeted behavior but also produce compensating behavior; for example when fuel-efficient cars lead people to drive more or if people are nudged to exercise more and ends up eating more too. Some nudges have only a short time effect and salient information can lose its effect, blend in and become background noise (Cass R Sunstein, 2017).

Motivational operations can only describe an event, object or situations that alters the reinforcing effectiveness a stimulus (Michael, 1993). MOs can take the form of law and legislation, fiscal and non-fiscal incentives and nudging as long as they have a behavior altering effect. If it is possible for reinforcement to produce changes in behavior for years there should be no reasons why motivational operations could not have lasting effects on the events that functions as reinforcers (M. J. Dougher & Hackbert, 2000).

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**MASTER'S THESIS**

**Læring i Komplekse Systemer**

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Can nudging improve hospital visitors hand hygiene compliance?

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## **Abstract**

Healthcare-associated infections (HCAI) affects hundreds of millions of patients worldwide. As multidrug-resistant organisms become more common the concern is growing. Most initiatives to reduce HCAI have focused on the improvement of medical personnel's hand hygiene behavior. The role of hospital visitors as a source of infection have received less attention.

This experiment used nudges to improve hospital visitors (N=390) use of hand sanitizers at Oslo University Hospital, Rikshospitalet in Oslo. Three different nudges were developed and tested for their effectiveness in the hospital. All three nudges included the placement of a hand sanitizer next to the door opener at a hospital ward. Two of the nudges had a red sign stating a descriptive or injunctive social norm. The two nudges had a significant greater impact on hospital visitors' hand hygiene compliance. As a conceptual replication can the results of this study confirms that nudges can influence and increase hospital visitor's compliance to hand hygiene behavior.

Healthcare-associated infections (HCAI) are the infections that patients acquire when they are patients in a hospital or during medical treatment for other conditions. Every year HCAs affect hundreds of millions of vulnerable patients worldwide, infections that induce more serious illnesses, prolonged hospital stays, long term disabilities and often result in the tragic loss of life. The European Centre of Disease Prevention Control estimates that 4 131 000 patients are affected by 4 544 100 episodes of HCAI in Europe every year resulting in 16 million of extra hospital days, 37 000 attributable deaths and a contribution to an additional of 110 000 deaths. The financial losses caused by HCAs are estimated to € 7 billion every year. In USA HCAs are one of the top ten causes of death with 99 000 diseased patients every year. The consequences are huge as millions of extra hospital days prevents or delays hospital treatment for patients waiting in a health line. Most of these infections are preventable. They are caused by many different factors related to systems and processes in healthcare and human behavior (Allegranzi et al., 2011). Normally HCAs are treated with antimicrobial drugs but as multidrug-resistant organisms become more common the concern is growing (Bascetta, 2010).

### **History of infection control**

#### **The importance of hygiene.**

As a chief nurse during the Crimean War (1854-1856) Florence Nightingale saved thousands of lives by improving the sanitary conditions in the military hospitals and barracks. In February 1855, the mortality rate at the hospital was 42.7% of the cases treated, half a year later the mortality had dropped to 2.2% (I. B. Cohen, 1984).

#### **Transmission of infection.**

Ignaz Semmelweis was the chief obstetrician at the Maternity Hospital in Vienna, Austria in 1847. He was disturbed by the high maternal mortality rate raging 18.27 percent in



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the ward operated by obstetricians and medicine students, in comparison the maternity mortality was 3 percent patients among those cared for by midwives. The obstetricians and medical students would start their day by conducting autopsy on women dead from perpetual sepsis and went on to do gynecological examinations of the women at the maternity ward. There were many theories trying to explain the high rates of infection; raging from overcrowding and poor ventilation to the onset of lactation or miasma. One day Semmelweiss witnessed a pathologist die of sepsis after cutting himself on a scalpel while performing an autopsy on a woman that died with puerperal sepsis. The pathologist illness mirrored that of women with perpetual sepsis. Semmelweiss concluded that the hands of a physician must be contaminated after an autopsy transmitting contaminated material to mothers in labor. He introduced chlorinated lime hand washing for all obstetricians and medical students and saw a dramatic decline in mortality rate from 18.27 to 1.27 percent (Lund, 2006; Zoltan, 2019).

### **Discovery of bacteria**

Robert Koch became the first to link a specific bacterium with a specific disease. In 1876 he provided proof of germ theory by isolating the cause of anthrax and showing it to be a bacterium. He learned that while certain chemicals killed bacteria, others merely inhibited them.

Louis Pasteur discovered how souring of wine and infectious disease shared a common thread in that they both might involve infection by microorganism. His suggestion that microbes can cause disease became known as the theory of disease. Pasteur proved that microorganisms could only develop where there is contamination.

Joseph Lister became aware of Semmelweiss' work and together with Pasteur realized the true nature of disease. At this time, major injuries, broken ones or surgery would often result in infection of the damage area, sometimes leading to amputation or death. He found that he could reduce the number of microorganisms on wounds and incisions by

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using bandages treated with phenol (antiseptic) and by spraying the wound with a fine mist of phenol during surgery. These practices greatly reduced the rate of infection and mortality of surgery patients (Blevins & Bronze, 2009).

### **The Discovery of penicillin**

Alexander Fleming discovered penicillin in 1928 while working on a series of experiments involving the common staphylococcal bacteria. He left an uncovered Petri dish next to an open window and it became contaminated with mold spores. Fleming observed that the bacteria in proximity to the mold colonies were dying. He isolated the mold and identified it as a member of *Penicillium* genus. It was not the mold itself but some juice it had produced that killed the bacteria. *Penicillium* proved to be effective against the pathogen that caused diseases such as scarlet fever, pneumonia, gonorrhea, meningitis and diphtheria. It took twelve years and the onset of World War 2 before penicillium was mass-produced and became available as a medicine (Tan & Tatsumura, 2015).

### **Studies targeting hospital visitors hand hygiene compliance**

Most studies on infection control and hand hygiene compliance in hospitals discuss how medical professionals can improve their hand hygiene compliance. There is no doubt that the main burden of infection control in hospitals lays with the medical professionals, but visitors interact with the same patients and can be carriers of bacteria that cause severe infections too. In a study whose sole purpose was to discover “Who goes in and out of patient rooms”, Arbogast et al (2018) reported that visitors and patients counted for 15.4 percent of all entries and exits from patient rooms in the acute care setting. If we take into account that approximately 2 – 8 percent of visitors disinfect their hands upon arrival at hospital before they visit their “loved ones” we can clearly see there is room for improvement (Safety & Organization, 2009).

A search was conducted with [www.scholar.google.no](http://www.scholar.google.no) on April 9, 2019 to find studies

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on “hospital visitors” + “hand hygiene behavior”. The search resulted in 86 articles, a second search was done with the British spelling of behavior (behaviour) to make sure no studies were left out, and three more studies were found. 67 of the articles were informational or based on observations of hand hygiene compliance, five articles were interventions targeting both visitors and medical personnel’s HHC behavior, two articles were studies to promote handwashing with soap in bathrooms, two articles discussed patients HHC behavior and one targeted the medical personnel’s HHC behavior. Only six of the articles were based on interventions to promote hospital visitors HHC behavior

### **The six studies targeting visitors HHC behavior.**

Fakhry, Hanna, Anderson, Holmes, and Nathwani (2012) placed alcohol-based hand rub dispensers at the entrance to a hospital ward. They installed electronic motion sensors and speakers in the ceiling next to the hand rub. The audible alert sounded the following message: “Please clean your hands with hand rub dispensers when entering or exiting any clinical ward”. During the implementation visitors HHC behavior increased from 10.6 percent to 63.7 percent.

Babiarz, Savoie, McGuire, McConnell, and Nagy (2014) installed a sanitizer-dispensing door handle in one of the examination rooms at a hospital inpatient ultrasound area. The intervention increased HHC behavior from 24.5 percent to 77.1 percent.

Kim and Lee (2019) conducted a study to see if visual and audible stimuli would effect HHC behavior differently at a children’s hospital in Korea. The visual cue was placed on the top of the hand rub and the audible cue was activated by a motion sensor, both interventions were located at the entrance to the ward. HHC behavior was 0.4 percent before the intervention, 2.3 percent after the visual cue and 3.8 percent after the audio-visual stimulation.

Birnback et al. (2012) conducted a study with three interventions at a teaching hospital

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in Miami. The interventions were located at the security desk where all visitors have to register before entering the hospital. The first intervention was the placement of a sign on the security desk stating: “Beware, all visitors must wash their hands”, in the second intervention an AHS dispenser was placed in front of the security desk, in the third intervention the sign was placed on the top of the AHS dispenser and an additional sign was placed on the security desk. HHC behavior was 0.52 percent at baseline and did not increase with the sign on the security desk, the introduction of the AHS dispenser increased HHC behavior to 9.33 percent and in the third intervention HHC behavior increased to 11.67 percent.

Willison-Parry, Haidar, Martini, and Coates (2013) placed a small mark of nontoxic, alcohol-soluble ink on the back of visitors hands using a cotton bud. The visitors were informed that the ink would be dissolved by the alcohol hand gel available in the clinic. Upon departure, visitors were asked whether they had washed their hands upon entry to the clinic; the intervention caused 68 percent to wash their hands as opposed to 25 percent who washed their hands without intervention.

“It’s in your hands” was a study that combined education, feedback, social environment, and parental engagement in a quaternary care referral center for critical ill infants (Chandonnet et al., 2017). Information sheets about HHC behavior were added to the parent’s information packet, posters were strategically placed for frequent viewing at sinks and hand sanitizers throughout the unit and additional hand sanitizers were added in several places to improve visibility. The bedside nurses were also provided with a checklist to trigger consistent parent and family HHC education. The HHC behavior increased from 71 percent to 89 percent.

“Nudging visitors hand hygiene compliance” was conducted at Gentofte Hospital in Denmark (Aarestrup, Moesgaard, & Schuldt-Jensen, 2016). The study was based on behavioral science and used nudges to improve visitors HHC behavior. The nudges were

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placed next to the door opener at the entrance to the medical ward. Each nudge condition had 30 participants and the study was conducted within a week. To construct a baseline a hand sanitizer was placed on the wall inside the ward. Nudge 1 was a red sign placed on the top of a hand sanitizer saying; “Here we use HAND DISINFECTANT in order to protect your relative”. Nudge 2 was a picture of a pair of eyes on the top of the hand sanitizer. Nudge 3 left the hand sanitizer alone without any sign attached to it. At baseline 3 percent of the visitors showed HHC behavior, Nudge 1 increased HHC behavior to 67 percent, Nudge 2 resulted in 17 percent HHC behavior and Nudge 3 resulted in 20 percent HHC behavior.

The nudge interventions were based on principles from behavioral sciences.

### **Behavioral Science**

Behavioral sciences understand behavior as a function of its environment and believes that we can alter behavior by making changes in the environment. Choices are always influenced by the context in which decision making takes place (Hansen & Jespersen, 2013). Decisions are often less deliberate and considered than has been assumed by classical economic theory and more habitual, automatic, and influenced by the environment (Hallsworth & Halpern, 2016). People do not make decisions based on logic and rationality alone, but they rather use a set of heuristics that aids them in making quick, and often satisfying decisions. From a Darwinian perspective the goal of an organism is not to follow logic, but to pursue objectives in its environment (Gigerenzer, 2008). Human behavior has evolved from conditions that are very different to those we now find ourselves in. For thousands of years fitness has been more important for the human race than accuracy and objectivity. The ability to make fast and satisfying responses would be crucial in a hostile environment, to stop and rationalize over pros and cons when hunted by a tiger would probably aid the tiger in its hunt but not end well for its prey (Sutherland, 2018). For policies, programs and products to be effective they need to understand human behavior

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and help people to follow through on the best decisions for themselves – and society (Kahneman, 2009). Behavioral economics is an enriched version of economic theory and implements findings from psychology and social sciences to get a better understanding of human choice behavior (Kahneman, 2013; Richard H Thaler, 2015).

### **Nudging**

Nudges are ways to make it easy for people to think or want to do certain things by making it compatible with their associative system, their value and desires (Kahneman, 2013). Nudges are used in an environment to alter certain behaviors by making small changes in the context surrounding the behavior (Richard H. Thaler & Sunstein, 2009). Small changes in the environment can have huge effects on behavior. A voice reminding visitors to use hand sanitizers increased HHC behavior from 10.6 percent to 63.7 percent (Fakhry et al., 2012), The placement of a hand sanitizer with a red sign next to the entrance of a ward increased HHC behavior from 3 percent to 67 percent (Aarestrup et al., 2016).

The context that people are making decisions in matters; things like when and how information is presented, the physical environment, and what other people around them are doing.

After a decade of empirical testing and implementation of nudges in public sector the Behavioural Insights Team have come up with a checklist essential to design effective nudges. For a nudge to be effective it must be *easy*, *attract* attention, *socially* acceptable and presented at the right *time*.

**Easy.** The more effort a behavior requires, the less likely it is that someone will do it. When Germany in 1980 introduced fines for not wearing motorcycle helmets it also resulted in a decrease in motorcycle thefts of more than 60 percent. In order to steal a motorcycle the thief would have to bring a their own helmet – a little too much of a hassle for most thieves (Mayhew, Clarke, & Elliott, 1989; Van Dijk, Mayhew, & Killias, 1990). The decrease in

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motorcycle thefts is a good illustration to show how small amounts of effort can have disproportionately large effect on outcomes (Hallsworth & Halpern, 2016). Richard Thaler always says that if you want to encourage something, make it easy! One way to make something easier is to remove friction. In order to make HHC behavior as easy as possible for hospital visitors a free-standing hand sanitizer were placed next to the door opener to the ward.

**Attract.** Every day people are exposed to an enormous amount of information and to make sense of it all they develop strategies to filter out most of this information and focus only on few pieces. Therefore, information is only likely to influence behavior if it is delivered in a way that attracts attention effectively (Hallsworth & Halpern, 2016). Our perception is not objective and we tend to detect contrasts rather than absolutes (Sutherland, 2018). Information that is vivid and salient is likely to have a much larger impact on people's behavior than information that is statistical and abstract (Sunstein, 2013). Most of the hospital environment is painted in white, giving it a clean and sanitary feel. In order to attract the visitor's attention to the hand sanitizer a bright red sign was placed on the top of it. The red color was meant to bear resemblance and trigger associations to red traffic signs and thereby communicate its importance to the visitors.

**Social.** Social norms inform an individual of what behavior that is expected and correct to perform in a given situation (Halpern, 2015). The expression "When in Rome, do as the Romans" speaks about how it can be wise to imitate the behavior of people around us if we are insecure of how to behave correctly. Because humans are social animals we are bound to each other in ways we not always are aware and deeply influenced by other people's thinking, judgments, and actions (Etzioni, 2011). When in college, most students have an exaggerated sense of how much their fellow student are drinking and using drugs. They tend to think that the percentage is higher than it is. When they are informed of the actual

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percentage, which is fairly low, the percentage goes down further (Richard H. Thaler & Sunstein, 2009).

Social norms in society, in a setting, and within a person will, in each case, have demonstrable impact on behavior, but what the impact will be differential depending on whether the actor is focused on norms of the culture, the situation, or the self (Cialdini, Reno, & Kallgren, 1990).

A norm must attract attention to have impact on behavior. Norms should motivate behavior primarily when they are activated; when someone is reminded of a certain norm the chance of compliance to this norm increases significantly. Enduring cultural, situational and dispositional conditions can influence someone's normative focus (Cialdini et al., 1990).

When considering normative influence on behavior, it is crucial to discriminate between the *is* (descriptive) and the *ought* (injunctive) meaning of social norms, because each refers to a separate source of human motivation.

*The descriptive norm* describes what is typical or normal. It is what most people do; if everyone is doing it, it must be a sensible thing to do. By simply noticing what most people are doing in a given situation and imitate their behavior, one can usually choose efficiently and well.

*The injunctive norm* refers to rules or beliefs as to what constitutes morally approved and disapproved conduct (Cialdini et al., 1990)..

The Danish study used a descriptive norm; "Here we use hand sanitizers", to evoke HHC behavior. The norm communicated the kind of behavior that was expected of the visitor; informing hospital visitors that it was a clear expectancy from the hospitals side that they would disinfect their hands before entering the wards.

The second part of the message; "in order to protect the one you visit" was constructed to evoke people's compassion and provide an explanation to the importance of HHC behavior.



## Can Nudging Improve Hospital Visitors Hand Hygiene Compliance?

Former studies have showed that people react stronger to an identified plea of help than a generalized one (Small & Loewenstein, 2003). The second part of the message is a conjunctive norm as it refers to an individual's moral and consciousness (Cialdini et al., 1990).

**Timing.** Timing is often a neglected part of policy and service design. The likelihood that an individual will accept an offer can vary greatly depending on when it is offered. Certain moments can disrupt existing patterns of behavior and provide the opportunity for change (Hallsworth & Halpern, 2016). An answer to a question depends on the context in which it is raised. To ask for help when someone is stressed and tired reduces the chances for a positive reply but a well-spoken word in the right moment can cause things to happen. It can be a stressful task for many hospital visitors to find their way to the right ward. When people are preoccupied and have their focus elsewhere it is more difficult to catch their attention. It was considered that the nudges would have most impact on hospital visitor's behavior when they were placed as close to the ward as possible, where the visitors had arrived at their destination.

### **Rationale and Aims**

The present study was a conceptual replication of the Danish study above. We set out to investigate if the results would be similar in a Norwegian hospital.

The dependent variable in this study was hospital visitors hand hygiene compliance to three different nudges.

The independent variable in this study was the presentation of three different nudge conditions and their influence on hospital visitors HHC behavior

The aim of this study was to investigate the question:

*“Can nudging increase hospital visitors hand hygiene compliance?”*

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As a conceptual replication of a successful study we expected the nudges to have a positive impact on hospital visitors HHC behavior. There were questions about the outer validity of the original study since the number of participants were a bit low and if cultural differences in Denmark and Norway would give us a different result. The hypothesis in this experiment was one-sided since we expected the nudges to have a positive impact on HHC behavior:

H<sub>0</sub>: Nudging has no influence on hospital visitors hand hygiene compliance.

### **Method**

Rikshospitalet University Hospital (Rikshospitalet) is a part of Oslo University Hospital (OUS). OUS is Scandinavia's largest hospital and conduct more than 1.2 million patient treatments annually (OUS-HF, 2016). Patients come here from all over Norway to receive medical and surgical treatment such as brain surgery and transplant of new organs. Patients will stay for the first critical days after surgery before they are sent home to their local hospitals for further recovery. During those first critical days their loved ones will visit in order to support and care for them.

Many visitors have been travelling from places outside Oslo and are not familiar with the architecture of the hospital. Besides being focus on finding the right hospital ward many visitors are preoccupied with concerns for their loved ones upon their arrival at the hospital. We can assume that a large percentage of the visitors are not accustomed to a hospital environment and the culture they entered in to; inclusive the importance of disinfecting their hands.

### **Participants.**

Participants for this study were 390 hospital visitors at Rikshospitalet in Oslo. The number of participants in the main study were 300 and the number of participants in the pilot were 90. The observation was naturalistic and every hospital visitor that passed through the glass bridge where the nudges were located were observed. (People wearing hospital uniforms

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and patients were excluded). The observed visitors were both male and female with ages varying from 10 to 90 years.

All observations in this study were anonymous. Data were recorded quantitative on a structural observation form. Data recorded were limited to whether the participant complied to the nudge, if the participant were male or female and an estimate to which age-group they belonged - no personal information of the participants were recorded.

Because of the nature of the study there were no need to inform the hospital visitors of their participation nor was it necessary to apply to regional ethical committee for permission (the privacy ombudsman at Rikshospitalet was contacted prior to the study and reassured us that no permission was needed as long as our data did not include any personal information).

**Sample size.** The Danish study saw a large effect size based on a sample size of  $N=30$  for each nudge condition, a total of  $N=120$ . As we were unsure of the outer validity of this study, we decided to base our sample size on a medium effect size. To detect a medium effect size between to independent means at  $\alpha = .05$  requires  $N = 64$  in each group. For a significant test of a sample of  $\alpha = .05$ , when the population  $r$  is medium, a sample size = 85 is required when the power is set to  $r = .80$  (J. Cohen, 1992). Larger samples are better approximations of the population and have less sampling error (Field, 2014). As a larger  $N$  increases the outer validity of a study, we decided to aim for a sample size of  $N=100$  in each nudge condition.

**Sampling procedures.** The study was located on the glass bridges that connect the hospital wards with treatment facilities like radiologic examination and operating theater. The glass bridges also connect the hospital wards with the elevators and stairways that patients and visitors use to enter and exit the different wards. The door in which staff, patients and visitors enter the ward from the bridge has a door opener located approximately two meters from the door. The door is double door that opens up automatically unto the bridge when the door opener is pushed to open. The nudges were located next to the door opener (see

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appendix A).

With exception for the first two nudges in the pilot, the observers were located in the main corridor (the glass corridor) with a clear view of the nudges and out of sight for hospital visitors (see appendix B).

### **Design.**

The study was a within group design; all hospital visitors in the study were a random sample of the population of visitors at the hospital. The hospital visitors scores were measured against other hospital visitors scores under different conditions. The study was a quasi-experimental design since random allocating would have been difficult without revealing the scope of the study. To improve the strength of the study the different nudges were alternated several times; over locations and days.

**Baseline measurement.** A pretest would provide valuable information about how many of the hospital visitors that were disinfecting their hands prior to the intervention. At Rikshospitalet hand sanitizers are placed at the main entrance and next to the sink in every bedroom and bathroom. An attempt to observe every visitor's compliance to every available hand sanitizer would be very demanding and, in some cases, an impossible and ethical questionable task. The researcher behind the Danish study created a dummy baseline by discreetly placing a hand sanitizer on the wall inside the ward. Three percent of the visitors used the hand disinfectant and created a baseline the interventions could be measured against.

We discussed the possibility of observing how many visitors that complied to the hand sanitizers at the main entrance of the hospital. We were made aware that all hospital staff and patients are frequenting the same entrance making it an impossible task to separate visitors from the other groups. In order to have a baseline to measure the nudges against we decided to make nudge 1 our baseline. Nudge 1 was the placement of a hand sanitizer next to the entrance of the ward, but with no signs attached to it.

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**Research design.** Data was recorder on a structured observation form. The form had three different categories for the observer to register; gender, age-group and whether the visitor complied to a nudge. From each category the observer could choose between these options; (1) was the visitor male or female, (2) which age-group did the visitor belong to; 0-20years, 20-40 years, 40-60 years or above 60 years, and (3) did the visitor comply to the nudge; yes or

Figure 1. Structural observation form

Hand Hygiene Compliance												
Date	Gender		Age-group estimat				Nudge 1		Nudge 2		Nudge 3	
	M	F	0-20	20-40	40-60	60+	Yes	No	Yes	No	Yes	No
		X		X						X		
	X				X				X			

### Experimental manipulation

**Instrumentation.** The hospital provided two free standing hand sanitizers for the study. The hand sanitizers were automatic with a sensor that discharged a certain amount of disinfectant when someone placed their hands underneath it. The hospital also provided the material for the signs that were used in the study. The signs were printed in color on a A3 printer, they were all made to fit the same size of 29x29 centimeters. The signs were laminated before they were assembled and fasten to the top of the hand sanitizer. The sign with the firm male eyes were 29 centimeters wide and 15 centimeters high. To move the hand sanitizers around to different locations, the hospital provided us with a small tray with wheels on.

**Pilot.** A pilot was conducted to see if choice of color on the sign would affect visitors HHC behavior differently. We were also interested to see to what degree the size of the typing on the sign would influence compliance and to check which of two versions of the injunctive

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message on the signs that had most impact on HHC behavior. We also wanted to take a closer look at the effect a sign with firm male eyes before we made our choice of nudges for our study. The signs were made on the hospital's printer with the dimension of 29x20 centimeters. The signs were laminated and attached to the dispensers with blue tac. There were nine different versions of nudges tested in the pilot, with N=10 in each condition (see appendix C).

1. A blue sign with a message in small print, saying: "Here we use hand sanitizers"; three visitors were complying.
2. A blue sign with a message in small print, saying: "Here we use hand sanitizers in order to protect your loved ones"; four visitors were complying.
3. A green sign with a message in small print, saying: "Here we use hand sanitizers"; two visitors were complying.
4. A green sign with a message in small print, saying: "Here we use hand sanitizers in order to protect your loved ones"; five visitors were complying.
5. A red sign with a message in small print, saying: "Here we use hand sanitizers"; one visitor was complying.
6. A red sign with a message in small print, saying: "Here we use hand sanitizers in order to protect your loved ones"; four visitors were complying.
7. A red sign with a message in large print, saying: "Here we use hand sanitizers in order to protect your loved ones"; seven visitors were complying.
8. A red sign with a message in large print, saying: "Here we use hand sanitizers in order to protect the one you are visiting"; five visitors were complying.
9. A sign with firm male eyes was placed on the top of the hand sanitizer; one visitor was complying.

For the first two nudges (the blue sign) the observer was standing opposite the elevator

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in the same hall the participants arrived at before crossing the glass bridge towards the door opener, were the nudges were located. Some of the visitors noticed the observer and started to look around to see what the observer was doing. It resulted in a higher compliance among the visitors. The observer moved to a different location in the glass corridor where it was easy to keep an eye on both visitors and nudges as all the bridges leading to the hospital wards in Rikshospitalet have walls of glass.

The results from the pilot indicated that large print on the signs gave more HHC behavior. As far as color was concerned, there were no clear indication that any of the three colors evoked more HHC behavior than the others. We decided to continue with red signs as in the original study.

**Independent variable.** *Nudge 1.* The first intervention was the placement of a free-standing hand-sanitizer next to the door opener at a hospital ward, without any information attached to it (see appendix D).

*Nudge 2.* In the second intervention we added a red sign to the top of the dispenser with a message in large print saying: "Here we use hand-sanitizers". The message on the sign was to communicate the norms visitors were meant to comply to when entering the ward. The message reflected a injunctive social norm (see appendix E).

*Nudge 3.* In the third intervention we added another red sign to the top of the dispenser with a message in large print saying: "Here we use hand sanitizers in order to protect your loved ones". The message on this sign were to communicate a descriptive norm for the visitor to follow (see appendix F).

**Reliability and validity.** Reliability is a measurement of the consistency of observations. Interobserver agreement refers to the degree two or more independent observers report the same scores after observing the same events.

The criterion for interrater reliability of a conceptual replication of a former field study is 85

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percent and a second observer must be present for at least 20 percent of the duration of the study. (Cooper, Heron, & Heward, 2007) We had a second observer present for 25 percent of the observations with an interrater reliability score at 96 percent.

Validity in the study ensures that the data are representative for the behavior of the population of hospital visitors at Rikshospitalet (Cooper et al., 2007).

In order to combat the possibility of measuring the same visitors several times we placed the nudges at different hospital wards every day for the first two weeks. Moving the nudges were also an indicator for the validity of the study and to control for variation in the population of visitors to the hospital. Between the second and third week of observation there was a week without any experiment or observations. In the third week we altered the nudges from day to day between the same two wards.

To improve the outer validity of the study the nudges were tested at different locations at the hospital, the three nudges were also alternated from day to day so that visitors would not be exposed for the same nudge several days in a row. Between the second and the third week of the study there were a full week with no intervention.

## Results

### Nudge 1.

Nudge 1 evoked 7 percent HHC behavior. The scores were distributed this way:

The total score of the male population were 7.3 percent; there were no male visitors in the age-group below 20 years, in the age-group 20-40 years,;10 percent of the men complied, in the age-group 40-60 years; 9 percent complied, and in the age-group 60+ years; 0 percent complied.

The total score of the female population were 6.3 percent; in the age-group below 20 years; 0 percent complied, in the age-group 20-40 years; 7 percent complied, in the age-group 40-60 years; 0 percent complied, and in the age-group 60+ years; 0 percent complied.



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### **Nudge 2.**

Nudge 2 evoked 46 percent HHC behavior. The scores were distributed this way:

The total score of the male population were 56 percent; there was one male visitor in the age-group below 20 years and he did not comply, in the age-group 20-40 years; 50 percent complied, in the age-group 40-60 years; 43 percent complied, in the age-group 60+ years; 64 percent complied.

The total score of the female population were 39 percent; there was one female visitor in the age-group below 20 years and she complied, in the age-group 20-40 years; 41 percent complied, in the age-group 40-60 years; 11 percent complied, in the age-group 60+ years; 59 percent complied.

### **Nudge 3.**

Nudge 3 evoked 40 percent HHC behavior.

The total score of the male population were 32 percent; there were three male visitors in the age-group below 20 years and none of them complied, in the age-group 20-40 years; 43 percent complied, in the age-group 40-60 years; 26 percent complied, in the age-group 60+ years; 30 percent complied.

The total score of the female population were 47 percent; there was one female visitor in the age-group below 20 years and she did not comply, in the age-group 20-40 years; 46 percent complied, in the age-group 40-60 years; 54 percent complied, in the age-group 60+ years; 46 percent complied.

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Figure 2. Distribution of scores for each nudge condition in percent.

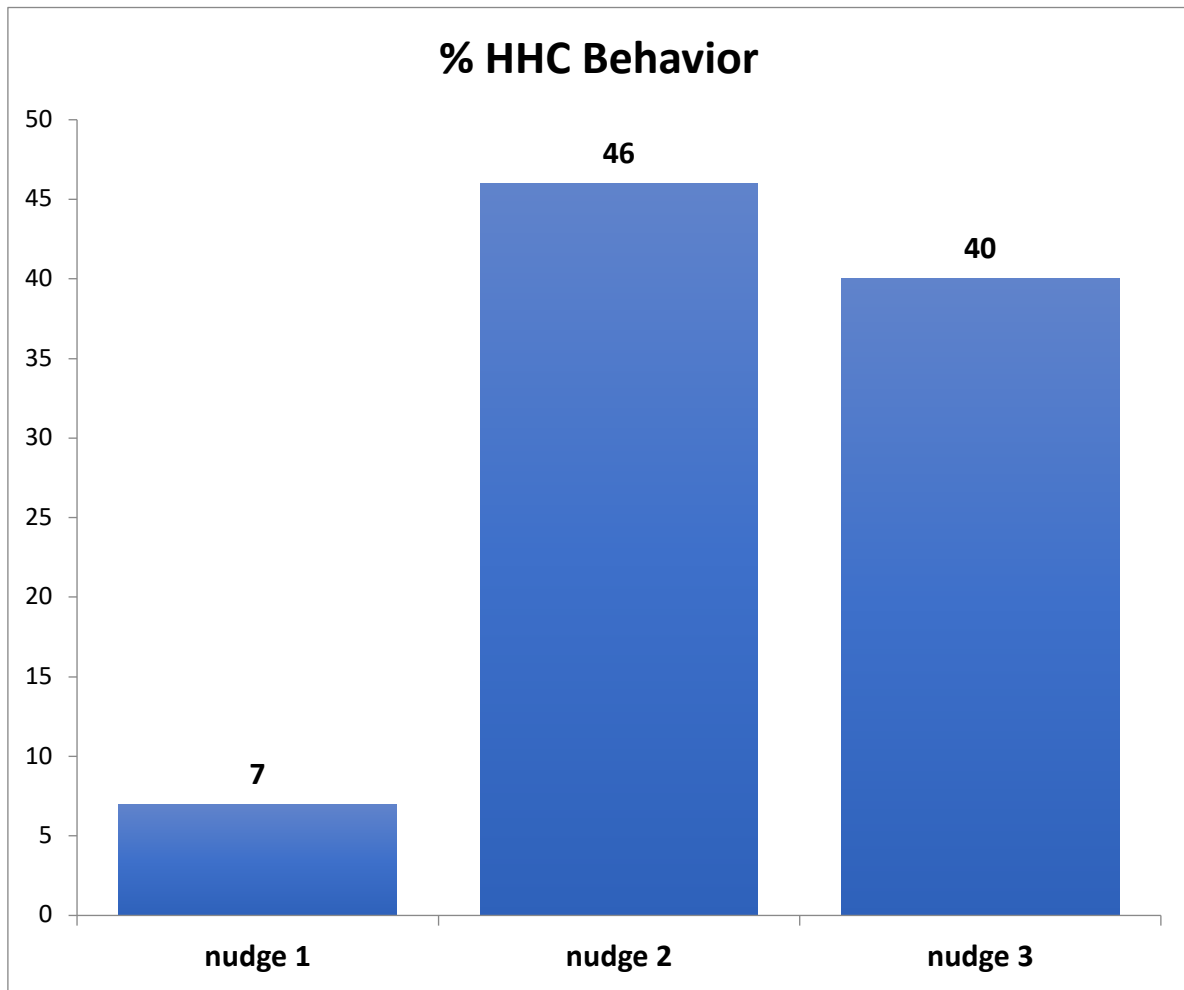
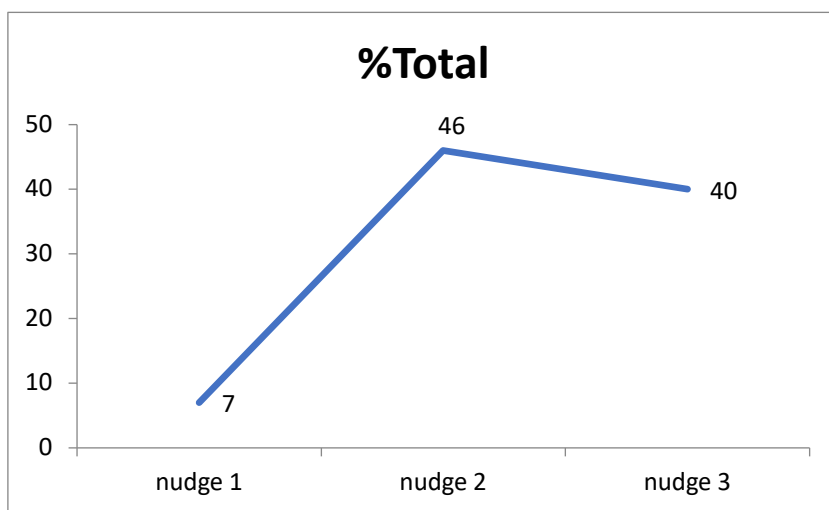


Figure 3. Distribution of scores for each nudge condition



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Figure 4. Distribution of scores between gender in each nudge condition.

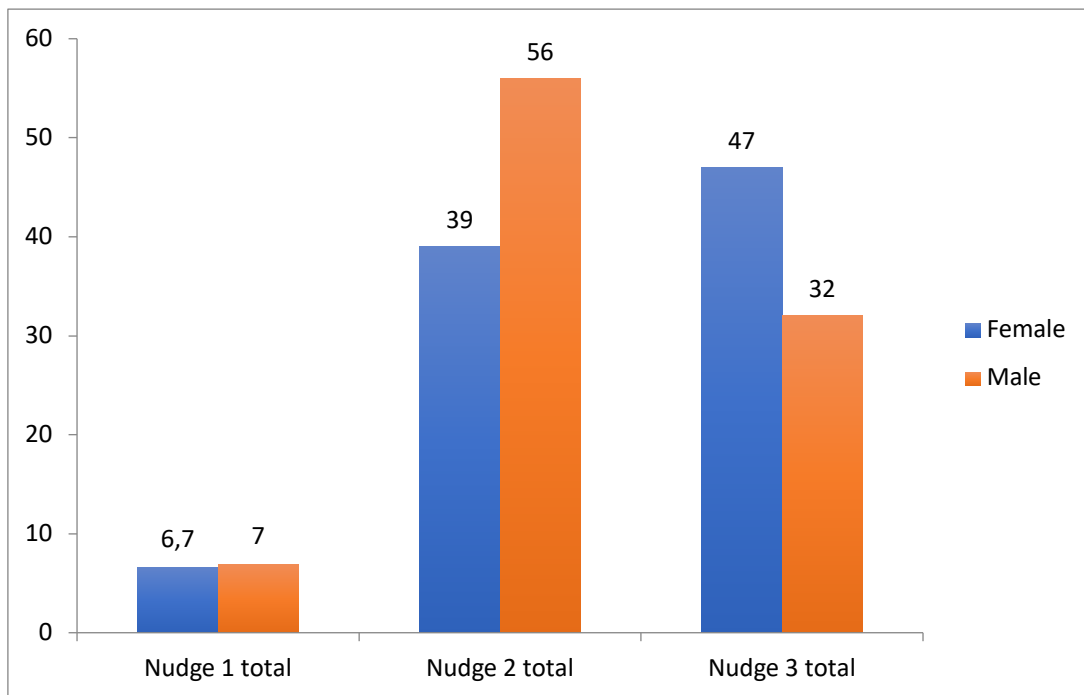
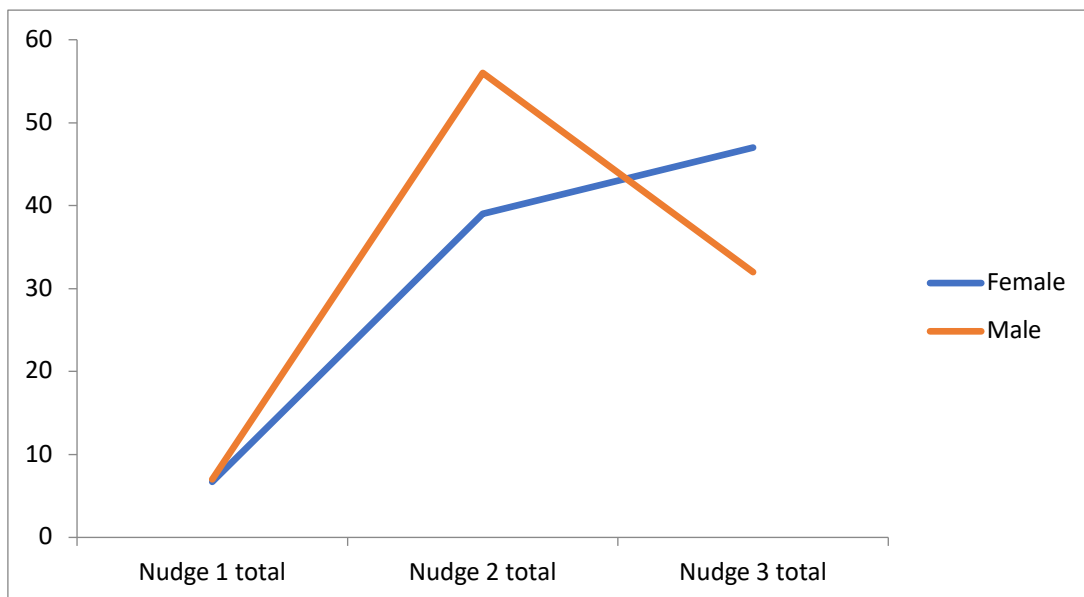
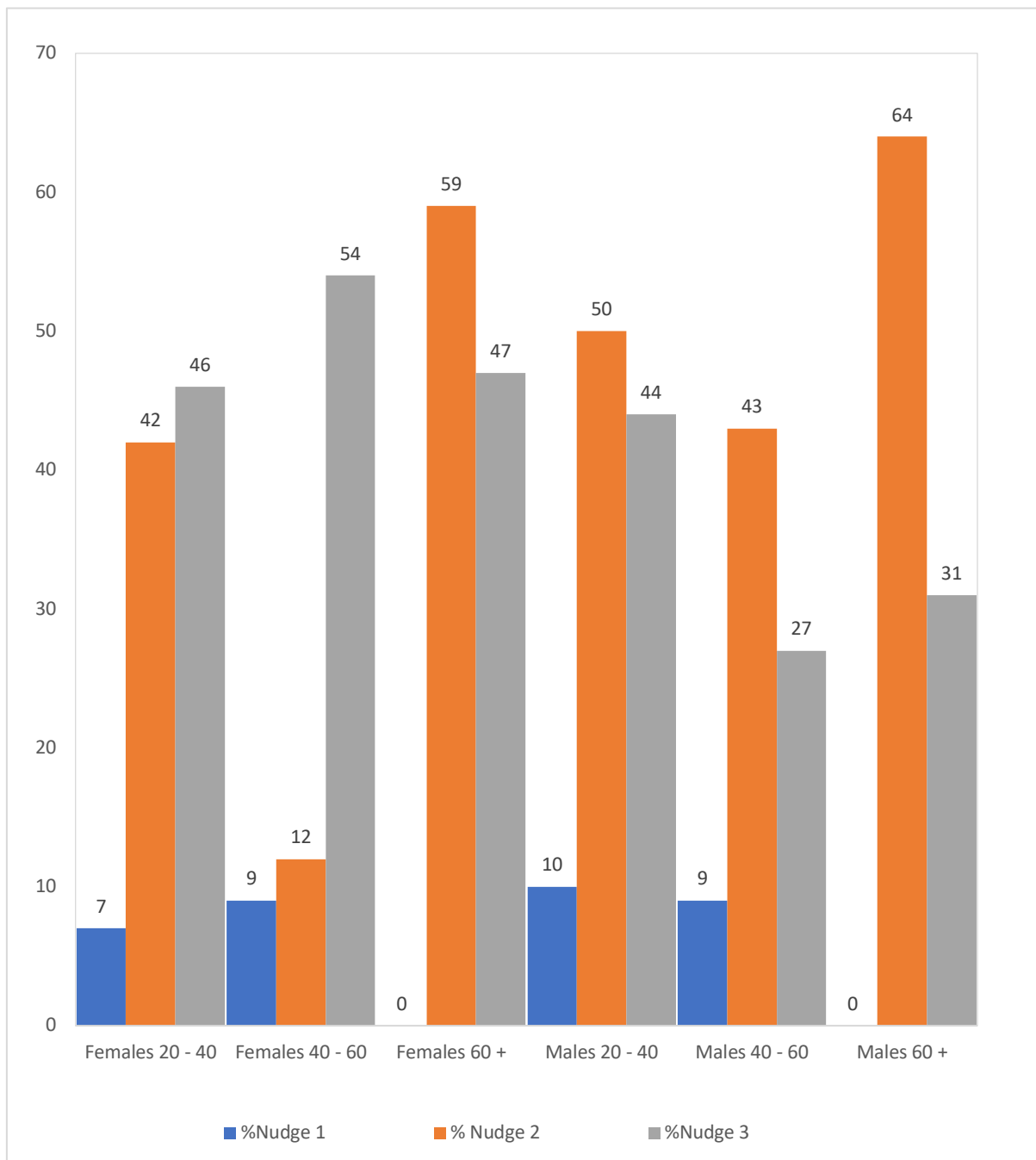


Figure 5. Graph comparing male and female HHC compliance in each nudge condition



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Figure 6. Total distribution of scores between each nudge condition, gender and age-groups.



\* There were very few hospital visitors in the age-group 0-20 years. The scores were creating outliers and were removed from the graph.

**Data analysis.**

The data from the study were categorical and a chi-square test was conducted to investigate whether the results of the study were significant.

**The results of a Chi square test between the scores of Nudge 1 and Nudge 2 were:**

There was a significant association between nudge 1 and nudge 2 in causing an increase in HHC behavior;  $X^2 (1) = 39,05, p < .001$ . Based on the odds ratio, the odds for nudge 2 to cause the increase in HHC behavior were 12,158 times higher than it would have been with nudge 1.

*Table 1 Chi square significance test between nudge 1 and nudge 2*

<b>Chi-Square Tests</b>					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	39,045 <sup>a</sup>	1	,000	,000	,000
Continuity Correction <sup>b</sup>	37,068	1	,000		
Likelihood Ratio	42,572	1	,000	,000	,000
Fisher's Exact Test				,000	,000
N of Valid Cases	200				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 26,50.

b. Computed only for a 2x2 table

Cramer’s statistic is .44 out of a possible value of 1 (see appendix G). This represent a medium effect size (Field, 2014).

**The results of the chi-square test conducted between the results of nudge 1 and nudge 3 were;** There was a significant association between nudge1 and nudge 3 in causing an increase in HHC behavior;  $X^2 (1) = 30,288, p < .001$ . Based on the odds ratio, the odds for nudge 3 to cause the increase in HHC behavior were 9,523 times higher than it would have been with nudge 1.

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Table 2 Chi square significance test between nudge 1 and nudge 3

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	30,288 <sup>a</sup>	1	,000	,000	,000
Continuity Correction <sup>b</sup>	28,480	1	,000		
Likelihood Ratio	32,769	1	,000	,000	,000
Fisher's Exact Test				,000	,000
N of Valid Cases	200				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 23,50.

b. Computed only for a 2x2 table

Cramer's statistics is .389 out of a possible value of 1 (see appendix H). This represent a medium effect size (Field, 2014).

**The results of the chi-square test conducted between the results of nudge 2 and nudge 3**

**were:** The association between nudge2 and nudge 3 were not significant.

Table 3 Chi square significance test between nudge 2 and nudge 3

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,734 <sup>a</sup>	1	,391	,475	,238
Continuity Correction <sup>b</sup>	,510	1	,475		
Likelihood Ratio	,735	1	,391	,475	,238
Fisher's Exact Test				,475	,238
N of Valid Cases	200				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 43,00.

b. Computed only for a 2x2 table

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The department for infection control at Rikshospitalet holds a regular podcast meeting where the different leaders and teams working with infection control can tune in. On June 13, 2018 we were invited to present the study for all the major hospitals in Norway on the regular podcast. The feedback was good, and the hospitals showed great interest in this kind of research.

### **Discussion**

This study set out to discover the effects of nudges on hospital visitors hand hygiene compliance. It also aimed to investigate the outer validity of the Danish study.

The hypothesis suggested that nudging could increase hospital visitors hand hygiene compliance. The hypothesis was proven. There was a significant effect in HHC behavior between nudge 1 and nudge 2 and between nudge 1 and nudge 3. The effect between nudge 2 and nudge 3 was not significant.

Nudge 1 was the placement of a free-standing hand sanitizer next to the door opener at a hospital ward. The placement of nudge 1 made it easy and convenient for visitors to comply to HHC behavior. Nudge 1 was also timely as the visitors had found their destination and could focus on disinfecting their hands before entering the “clean zone” of the hospital ward. But with so much facilitation nudge 1 only evoked 7 percent compliance. The same nudge evoked 20 percent compliance in the Danish study. Nudge 1 was tested on several locations (wards) at the hospital. The first location was at the entrance to the ward for thorax and lung patients. There was a sign on the door that children below the age of 11 were not allowed in because of the danger of contamination and still, after 38 observations there were 0 compliances (see appendix D).

Why were there so few compliances? One answer might be that the hand sanitizer blended in with the background and caused few visitors to notice it or understand what purpose the hand sanitizer served. In the Danish study the order of the nudges was differently. The observations

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lasted for a week and nudge 3 was introduced as the first intervention achieving 67 percent HHC behavior. There might have been that some of the hospital visitors that first were exposed for nudge 3 learned and generalized their compliance to the other nudges as they were placed at same location for the whole week.

Nudge 2 was the placement of a free-standing hand dispenser next to the door opener at the hospital ward with a red sign on the top saying: “Here we use hand sanitizers”. This nudge implemented all of the four tools in the Behavioral Insights Teams (BIT) toolbox. The location of the nudges were at the entrance to the ward making them easily accessible and timely. The nudge had a red sign constructed to attract visitor attention and it stood in stark contrast to the white hospital walls. The message on the sign communicated a descriptive norm and explained to hospital visitors the norms for hand hygiene compliance at the hospital (Halpern, 2015).

Nudge 3 was the placement of a free-standing hand dispenser next to the door opener at the hospital ward with a red sign on the top saying: “Here we use hand sanitizers in order to protect your loved ones”. Nudge 3 evoked 40 percent compliance which was a significant increase in compliance compared with baseline (nudge 1). Nudge 3 implemented all four tools from the BIT toolbox as well. The message on the sign was an injunctive norm, explaining to hospital visitors why they needed to disinfect their hands – “in order to protect your loved ones”. This message resulted in 70 percent compliance in the pilot, which was much higher than the compliance it evoked in the study. In Denmark, a similar message stating “in order to protect the one you are visiting” evoked 67 percent compliance. The high percentage in both the pilot and the Danish study might be due to differences in population based on smaller sample sizes.

The results for nudge 2 and nudge 3 reveal an interesting variation between compliance, gender and age-groups. Women in the age-group 40-60 years showed a much



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higher compliance to nudge 3 (54 percent) than they did to nudge 2 (12 percent), the difference were significant at  $p < .01$  and had a medium effect size. Women in the age-group 20-40 also seemed to prefer nudge 3 (46 percent) over nudge 2 (42 percent), but the variation was not significant.

The majority of the hospital visitors showed most compliance to nudge 2. The female population of 60 years and above and all of the male population showed a preference for nudge 2 over nudge 3. In the male age-group of 40-60 years the variation in compliance between nudge 2 and nudge 3 was significant at  $p < .013$  with a small effect size. The differences between gender and age-groups will be discussed later under social norms and compliance.

### **Make it easy**

Hallsworth & Halpern (2016) discussed how small amount of effort can have a disproportional large effects on outcomes and that is why nudges are designed to make it easier for people to choose the “right” option. The placement of the nudges was an attempt to make HHC behavior easier. This study saw only a small difference in compliance when friction was removed, and the hand sanitizer was made easily accessible.

### **Attracting attention**

As mention earlier, the placement of the hand sanitizer with no signs attached to it evoked only 7 percent HHC behavior. Visitors were passing the hand sanitizer without paying any attention to it. It is possible that visitors noticed the hand sanitizer but didn't know what it was nor that it was there for them to disinfect their hands.

The introduction of a sign with strong color attract much more attention. Both because of placement and color nudge 2 and nudge 3 evoked significantly more HHC behavior. There was no difference in compliance as far as the colors on the sign were concerned. The pilot revealed that both the blue and the green sign evoked just as much HHC behavior as the

red sign.

### **Social norms and compliance**

A social norm inform a person of which behavior that is expected and correct to perform (Halpern, 2015). Social norms in society can be different from the social norms in a setting, and the social norms in a setting can be different from the social norms of a person. The social norm the person chooses to follow or that is activated in a situation will have a visible impact on their behavior (Cialdini, Reno, & Kallgren, 1990). When someone is reminded of a certain norm the chance of them complying to that norm increases significantly.

Nudge 2 and nudge 3 used different social norms to communicate the importance of HHC behavior. The message nudge 2 was based on was a descriptive norm. A descriptive norm describes what is typical or normal, what most people do. The norm communicated to the visitor the kind of behavior that was expected of them to perform in a hospital environment and inside the ward. Nudge 3 was based on an injunctive norm. An injunctive norm refers to rules or beliefs and what is morally approved. The norm was constructed to evoke visitor's compassion and moral consciousness.

The differences in compliance between the descriptive norm (nudge 2) and the injunctive norm (nudge 3) were not significant but unveiled some unexpected differences between gender and age-groups. Cialdini, Reno & Kallgren (1990) discussed how the social norms a person is exposed to can have different effects on behavior depending on which norm the person is focusing on. A person with strong personal convictions about a matter will be more hesitant to give in to social norms that contradict their personal norm than someone that is more focused on contextual norms and the importance to fitting in. During our observation there were times that visitors would arrive in groups of three or more. The groups dynamic was very different between groups. In one group could a person attempt to persuade the rest

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of the group to use the disinfectant and succeed. In another group we could observe how two visitors would disinfect their hands while the third person would be watching them and not comply. These observations raised the question to why someone purposely refused to disinfect their hands after being informed by the norm.

### **Timing of nudges**

Timing can have a great influence on behavior. The likelihood that someone will accept or reject an offer can vary greatly depending on when it is offered (Hallsworth & Halpern, 2016). The placement of nudges took into account that many visitors would spend time and energy on finding the right ward at the hospital. Upon arrival at the ward it was thought that visitors would be more alert to comply to the different nudges. As nudge 1 was both easy and timely there was a clear understanding that its ability to impact behavior was not powerful enough.

### **Limitations**

Even if the study proved that nudges were effective to improve visitors hand hygiene compliance, none of the nudges were able to evoke the same compliance as where seen in Denmark. The structural observation form left us with no information as to why some visitors decided not to comply to the nudges. This information would be very useful as it could have provided important information of how to improve the nudges. We could have interviewed the visitors to find out why they did/ did not comply to the nudges.

### **Conclusion**

Healthcare-associated infections affects hundreds of millions of patients worldwide every year. Most of these infections are preventable. Hospital visitors interact with the same patients as health personnel and can be carriers of infections. This study was a conceptual replication of a Danish study that increased hospital visitor's use of hand disinfectant from 3 percent to 67 percent. The replication study took place in Rikshospitalet University hospital

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with N=390 over a three-week period.

The nudges were based on following principles from behavioral economics; make it easy, attract attention, use social norms and find the best timing. Nudge 1 was the placement of a free-standing hand sanitizer next to a hospital ward, nudge 2 and nudge 3 had a red sign placed on the top of the hand sanitizer with a descriptive normative or an injunctive normative message. The result for Nudge 1 was 7 percent compliance, for Nudge 2; 46 percent compliance and nudge 3; 40 percent compliance. The study confirms that nudges can improve hospital visitors hand hygiene compliance. The study is important because it can help prevent suffering and deaths caused by hospital infections.

The results of this study indicate that it is not enough to make a good choice easily available and timely when it is unable to attract attention and communicate a message.

### **Directions for future research.**

The present study demonstrated how the use of different social norms impacted HHC behavior differently depending on the visitor's gender and age-group. Future research could investigate the differences further with the purpose to find messages that can have an even stronger effect on visitors HHC behavior. A part of the investigation could be based on a qualitative questionnaire with examples of different norms and the combination of norms to explore which norms that has the greatest impact across gender and age-groups.

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## Appendices

### Appendix A



Appendix B





Appendix B



Appendix C

<p>Her bruker vi</p> <p><b>HÅNDSPRIT</b></p>	<p>Her bruker vi</p> <p><b>HÅNDSPRIT</b></p> <p>....for å beskytte dine pårørende</p>
<p>Her bruker vi</p> <p><b>HÅNDSPRIT</b></p>	<p>Her bruker vi</p> <p><b>HÅNDSPRIT</b></p> <p>....for å beskytte dine pårørende</p>
<p>Her bruker vi</p> <p><b>HÅNDSPRIT</b></p>	<p>Her bruker vi</p> <p><b>HÅNDSPRIT</b></p> <p>....for å beskytte dine pårørende</p>

Her bruker vi

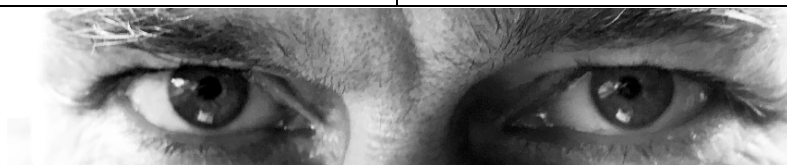
**HÅNDSPRIT**

....for å beskytte  
dine pårørende

Her bruker vi

**HÅNDSPRIT**

....for å beskytte  
den du besøker



Appendix D



Appendix E



Appendix F



Appendix G

**Symmetric Measures**

		Value	Approximate Significance	Exact Significance
Nominal by Nominal	Phi	,442	,000	,000
	Cramer's V	,442	,000	,000
	Contingency Coefficient	,404	,000	,000
N of Valid Cases		200		

Appendix H

**Symmetric Measures**

		Value	Approximate Significance	Exact Significance
Nominal by Nominal	Phi	,389	,000	,000
	Cramer's V	,389	,000	,000
	Contingency Coefficient	,363	,000	,000
N of Valid Cases		200		





# Håndspritstudien

Dato	Gender		Age-group estimat				Nudge 1		Nudge 2		Nudge 3	
	M	F	0 - 20	20 - 40	40 - 60	60 +	Yes	No	Yes	No	Yes	No
		x	x									x
		x				x					x	
	x				x						x	
		x				x					x	
		x		x								x
		x				x						x
		x			x							x
	x		x									x
#####	x			x							x	
		x		x							x	
		x		x								x
	x			x							x	
<b>N=50</b>		x		x								x
#####	<b>D3: 4 etg</b>											
	x			x							x	
	x			x								x
	x					x						x
		x			x						x	
		x			x						x	
	x					x						x
	x			x								x
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		x				x						x
	x					x						x
	x					x						x
		x</										



# Håndspritstudien

Dato	Gender		Age-group estimat				Nudge 1		Nudge 2		Nudge 3	
	M	F	0 - 20	20 - 40	40 - 60	60 +	Yes	No	Yes	No	Yes	No
#####	x				x					x		
		x		x						x		
	x			x						x		
		x		x						x		
	x			x						x		
		x		x						x		
		x			x				x			
		x		x					x			
	x					x			x			
		x				x				x		
		x			x					x		
		x			x					x		
		x				x			x			
		x				x			x			
		x							x			
	x			x					x			
		x		x					x			
	x			x					x			
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		x							x			
		x							x			
		x							x			
	x			x					x			
	x					x			x			
	x					x			x			
		x				x			x			
		x				x			x			
#####	x			x						x		
	x					x			x			
		x			x					x		
		x				x			x			





# Håndspritstudien

Dato	Gender		Age-group estimat				Nudge 1		Nudge 2		Nudge 3	
	M	F	0 - 20	20 - 40	40 - 60	60 +	Yes	No	Yes	No	Yes	No
	<b>Transplantasjon av organer og Lungesykdommer/ Thorax</b>											
#####		X			X			X				
	X				X			X				
		X		X				X				
		X		X				X				
	X			X				X				
		X		X				X				
		X			X			X				
		X		X				X				
		X			X			X				
	X			X				X				
	X			X				X				
		X		X				X				
		X			X			X				
	X			X				X				
		X		X				X				
	X				X			X				
		X		X				X				
		X			X			X				
	X							X				
	X			X				X				
		X			X			X				
	X							X				
	X			X				X				
		X			X			X				
<b>N=37</b>		X			X			X				







# Håndspritstudien

Dato	Gender		Age-group estimat				Nudge 1		Nudge 2		Nudge 3	
	M	F	0 - 20	20 - 40	40 - 60	60 +	Yes	No	Yes	No	Yes	No
#####	D4: 3 + 4 etg											
		x		x				x				
		x			x			x				
	x				x			x				
	x			x				x				
		x		x				x				
		x		x			x					
		x			x			x				
	x				x			x				
		x		x				x				
	x			x				x				
	x			x				x				
	x			x				x				
	x				x			x				
		x			x			x				
		x		x			x					
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		x			x			x				
	x				x			x				
		x			x			x				
		x			x			x				
	x			x				x				
		x			x			x				
N=25		x			x			x				
N=99	D4 3etg											
#####	x					x		x				
N=100								7	93			
Dato	Gender		Age-group estimat				Nudge 1		Nudge 2		Nudge 3	



# Handspritstudien

Nudge 1 7 %









# Handspritstudien



# Handspritstudien

## KLAUSULERING AV OPPGAVE AV ANDRE GRUNNER ENN LOVBESTEMT TAUSHETSPLIKT

AVTALE INNGÅTT MELLOM HØGSKOLEN I OSLO OG AKERSHUS, FAKULTET FOR HELSEFAG OG

STUDENT Laila Stokke FØDT 230566

Studentnummer: s290726

Studieprogram: MALKS

Der master- eller bacheloroppgaver ikke inneholder opplysninger undergitt lovbestemt taushetsplikt, kan Høgskolen i Oslo og Akershus med hjemmel i åndsverksloven § 27, jf. offentlighetsloven § 2 og § 6 nr. 6, gi forskere og studenter *innsyn* i oppgaven, men uten at disse kan sitere fra oppgaven.

Studenten kan reservere seg mot at oppgaven gjøres tilgjengelig i høgskolens åpne vitenarkiv, ODA. Dersom denne adgangen til klausulering benyttes, må varighet og begrunnelse angis fra studentens side. Oppgaven vil da bli oppbevart i et lukket arkiv i den oppgitte perioden.

Jeg reserverer meg herved mot at oppgaven gjøres tilgjengelig i høgskolens åpne vitenarkiv, ODA før embargotidens utløp (1-5 år).

*Oppgavens tittel:*

1. To What degree can Motivational Operations Explain Nudging?
2. Can Nudging Improve Hospital Visitors Hand Hygiene Compliance?

Adresse:	Vivestadlinna 375, 3175 Ramnes	
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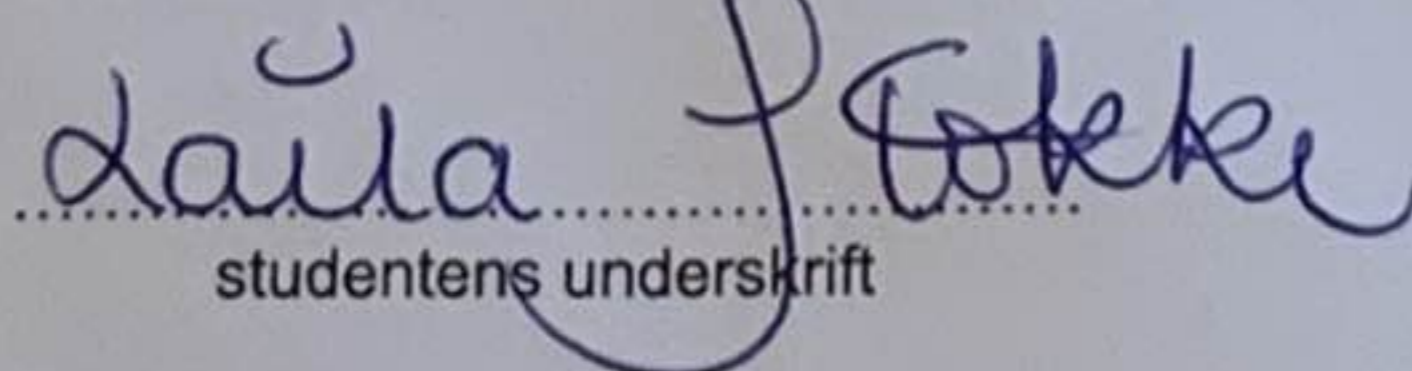
Faglig veileder:	Hilde Mobekk	
Institutt:	Institutt for Atferdsvitenskap	
Jeg tilrår at oppgaven klausuleres	Sted:	Dato:
	Veileders underskrift:	

Maksimumstid for denne type klausulering er 5 – fem år (embargotid).

Klausuleringen gjelder for 2 år og settes på grunn av:

Det skal skrives en artikkel basert på oppgaven,

Siden publiseringsprosessen kan ta noe tid ber jeg/ vi om 2 års klausulering

  
.....  
studentens underskrift