Bachelor Thesis: Teaming with Robots - Do people trust a human advice more than a system advice?

Henrike Haase
s1605615

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Psychology of Conflict, Risk and Safety

Prof. Dr. José Kerstholt

Wendy Schreurs, Msc.

UNIVERSITEIT TWENTE.

Abstract

Technical devices have become a great help to humans in a lot of different situations. One new approach is the implementation of a decision-aid called “predictive policing” in the work of police officers, which could challenge the way in which human and machines interact. The decision-aid will give evalutions and advices when and where police officers should be present in order to prevent crimes.

In this study, participants were asked to imagine a scenario in which they were the police officers and to make a decision on how to handle a risky situation. Decision-aids in general and specifically in the field of police work are relatively new. Therefore, it was hypothesized that humans trust another human more and accept an advice from another human more often than from a machine. Further, it was hypothesized that they rather make their own decision on how to react instead of being told what to do by the decision-aid. The participants’ feeling of authority was supposed to mediate between the level of trust and the chances of taking the advice.

The results did not confirm that people take an advice from the human more often than from the machine and they also did not prefer to have a choice, but rather an obligation. The results confirmed that they trusted a human more and on the contrary to what was expected, they trusted the obligation more. A mediating role of authority was also not confirmed.

Further research on the topic of advice-taking is needed to be able to successfully implement decision-aids.

Teaming with Robots: Do people trust a human advice more than a system advice?

Imagine a world without any technical devices. No cell phones and laptops, and possibly worst: no internet access. Nowadays, it is almost unimaginable to be without the help of technical devices. Technology has been growing rapidly during the last couple of decades. It developed from purely mathematical helping devices to highly complex machines that influence us in almost every part of our lives. People use technology to track their health with the use of smartwatches, shop for clothes and groceries online or look up directions (Norberg, Horne & Horne, 2007). The given personal information is for example used by the government to track people's behavior on the internet and in public places, also for the safety of society (Smith, Szongott, Henne & Von Voigt, 2012). Also the police has made an attempt to reduce crimes by relying on new technologies. One example is "Predictive Policing", which uses information of old cases and statistics to calculate the chances of crime in specific areas.

As described above, different parties rely on the information they receive from technological devices and make decisions that are influenced by the provided information. To this point, it is not always clear how humans are influenced by technology, why they interact with it the way they do and when exactly they rely on the given information (Bahner, Hüper & Manzey, 2008; de Vries, Midden, & Bouwhuis, 2003). However, if people and also public institutions like the police rely on decision-aids, it should be of interest to investigate the underlying factors that affect the use of decision-aids and what makes people accept the information they receive from these decision-aids. Especially if they are able to increase the safety of society, acceptance of these aids should be analyzed. Predictive Policing has made promising progress and seems to be able to reduce crime significantly

(Smit, Vries, Kleij, & van Vliet, 2016). That is why the current study is specifically focused on predictive policing.

Human Computer Interaction

The question of how humans interact with machines is specifically addressed by the field of Human Computer Interaction (HCI). HCI explores the many different factors that influence how humans and machines cooperate and influence each other, ranging from design choices of devices like decision-aids to personality factors in humans.

Recently, computer-based processes such as autonomous decision-making or automation have been implemented in airplanes, cars, or the industry (Shneiderman, 2016). Automated processes can be a great help to maintain safety, but also pose a great risk when not operated correctly (Shneiderman, 2007). Prominent examples are accidents of autonomous cars, in which the system did not react to an upcoming obstacle and the driver did not intervene as he would have when driving without the system (Singhvi & Russell, 2016). In some other cases, people believed in the information given by a decision-aid, even though it was false. This has been shown in complex tasks, where the safety of people was on the line (Bahner, Hüper & Manzey, 2008).

Because the consequences of failure in HCI can have such a great impact, an important topic is the interaction of humans and machines when it comes to the domain of safety. Particularly important is the role of advice, namely the relation between machines and computers in terms of advice giving and receiving (Liebermann, 2001). On the one hand, people might have gotten used to using machines without being aware of the necessity of human control and questioning the machines' correctness (Shneiderman, 2007). A lot of tasks that we used to do by ourselves, like calculating or reading a map, are now often facilitated or completely done by machines and people rely on the information they receive.

On the other hand, people might not act in line with the machines' advice, because they believe more in their own skills (de Vries, Midden, & Bouwhuis, 2003). Unfortunately, it is not yet clear when people listen to a machine and when they do not.

Thus, the interaction of humans and machines in terms of advice taking and decision making is important in the safety domain (Skitka, Mosier, & Burdick, 2000). Currently, decision-aids are not only used in self-driving cars or factories (Lee & Moray, 1994), but there is also an attempt to implement it in another safety-related field. As stated above, a new program in the safety domain, which is called predictive policing, has been developed and it could influence the work of police officers to a great extent.

Predictive Policing

Predictive Policing is supposed to predict where a crime will take place. The ultimate goal is to be able to prevent crimes from happening in the first place (Smit, Vries, Kleij, & van Vliet, 2016). In order to do so, computer systems are used as resources to analyze old cases, times, weekdays and other risk factors which then make up a virtual map of risky areas. Algorithms, software and other intelligent techniques are often better than humans at analyzing complex situations, especially when there is a lot of information to be processed (Shneiderman, 2016). Their decisions are often faster and more accurate (Bahner, Hüper & Manzey, 2008). When all previous information is analyzed, the system produces a heat-map, indicating areas that are vulnerable for crime. On the basis of the outcome of the analysis an advice is given as to where it would be worthwhile for the police offciers to go to (Smit, et al., 2016).

Without the use of such machine analysis, decisions are mainly based on human intuition and experience. Police officers decide themselves where to go to, either based on experience, because something has already happened, or because a superior tells them to

go (Smit, Vries, Kleij, & van Vliet, 2016).

The question remains whether and under which circumstances could a decision-aid be helpful for police work. Earlier research also assumed that neither a human alone nor a machine is the optimal decision-maker, but rather the interaction of them both (Dzindolet, Peterson, Pomranky, Pierce, & Beck, 2003). Others proposed that the machine is only a helping device, leaving the ultimate decision to the human controller (Lieberman, 2001). These statements are in line with the intention of predictive policing. It is supposed to be used as an addition to the police officers' expertise and will then be able to predict and prevent crimes from happening (Smit et al., 2016).

Thus, research needs to be done to assess the helpfulness, use and acceptance of such a device. If predictive policing is indeed able to forecast an upcoming crime, it is crucial that the police officers listen to the advice and act accordingly, so that the crime can be prevented. Ideally, the officers listen to correct advice from the machine, but still remain autonomous enough to intervene if needed.

Predictive Policing is currently tested in many different US cities while similar systems are tested in the Netherlands. In some cities, Predictive Policing was able to reduce the number of crimes up to 27%, which further stresses the importance to investigate the acceptance and use of this device (Smit et al., 2016).

Psychological factors in decision-making

This new technology interferes with the way in which decisions have been made before by the officers. Until now, police officers relied either on their own intuition or on another human's opinion when they made a decision (Smit et al., 2016).

Social norms and interaction with others played a crucial role in decision-making. Listening to others and accepting advice from supervisors are anchored in our way of making

decisions. Authority is influenced by evolutionary developed social norms of adhering to superiors and is said to be one of the keystones of human morality (Graham, Haidt, Koleva, Motyl, Iyer, Wojcik & Ditto, 2012). People with a higher feeling of authority often feel more obliged to follow advice (Haidt & Graham, 2006).

In other cases, however, people do not take advice from others, because they view their own judgements to be superior to others or because they have no insight into the others' chain of thought (Gino, 2008).

It is assumed that personality factors also play an important role (Stefanou, Perencevich, DiCintio, & Turner, 2004). Research in social psychology showed that most people feel a threat to their self-esteem and restricted in their freedom of choice when help is provided (Dalal & Bonaccio, 2010). The obligation to follow a course of action was seen as the most limiting form of advice (Dalal & Bonaccio, 2010). Furthermore, situational factors like the perceived workload can play a role in the use of advice (Prinzel III, DeVries, Freeman & Mikulka, 2001). Research has shown, that providing options from which the person has to choose from to make a decision can lead to cognitive workload which resulted in less critical thinking (Stefanou, Perencevich, DiCintio, & Turner, 2004).

When it comes to advice-taking in HCI, it also depends to a great extent on the level of trust. Earlier research has shown that trust in machines can vary before and after the device makes a decision, meaning that trust is influenced by whether the machine's advice was correct or not (Bisantz & Seong, 2001). There has been research in which people trusted the machine too much and cases in which people trusted themselves or other humans more. The cases in which trust in machines was higher often included studies in which people had gotten used to the machine's help (Shneiderman, 2007). Further, interaction with machines is influenced by the trust humans have in themselves and in their own skills (Bisantz &

Seong, 2001; de Vries, Midden, & Bouwhuis, 2003). When they were allowed to choose between a human and a machine, they were most likely to follow their own instinct (de Vries, Midden, & Bouwhuis, 2003; Gino, 2008). This was true when the level of trust in one's own skills exceeded trust in the machine (de Vries, Midden, & Bouwhuis, 2003). Thus, trust might have an important role in the process of accepting a device's recommendation. This is in line with cases, where humans were overly confident in the machine's decision, even when it was not successful. They also did not control it as much as needed and were not aware of the possibility of automation failure (Bahner, Hüper & Manzey, 2008; de Vries, Midden, & Bouwhuis, 2003).

By implementing predictive policing, the officer has to choose between a human advice and a machine advice, if their planned courses of action differ. To this point, there has been little research dealing with the differences of acceptance of an advice from a human or a machine. Earlier research has only shown that humans have a tendency to stick to their own plan of action, even when (human) expert advice suggested another course of action. This was often justified because they believed their own beliefs to be superior to those of the experts (Gino, 2008).

Other research investigated the use of either information or a decision aid. While the former only provides an assessment of the situation without any judgement, the latter commands an obligated course of action. It was shown that people prefer to receive information on the situation instead of being told what to do (Dalal & Bonaccio, 2010). Further, it was shown that use is very much dependent on the correctness of the results (Bisantz & Seong, 2001).

Taken together, research has shown that factors like trust, personality factors like self-esteem and authoritarian social norms, influence decision-making. However, there has

not yet been a clear explanation in terms of HCI and decision-making. Thus, further research is needed to gain insight into the difference of accepting advice between humans and machines, especially to be able to successfully implement programs like predictive policing. The aim of this paper is to analyze the underlying factors of the acceptance of decisions aids. Differences between accepting a definite advice ("obligation") or a range of options ("choice") from either another human or a machine will be tested. The level of authority will be taken into account to assess in how far it plays a role in advice-taking and decision-making. Referring back to predictive policing, officers often work in a hierarchical structure and have to make choices, for which they can be held accountable. The feeling of authority is of interest because it might influence advice taking due to the hierarchical structure of the police. An investigation on this factor might shed some light on the underlying factors of decision-making with regards to predictive policing.

Based on earlier research, it is hypothesized that people are most likely to accept an advice when they are given a choice and not an obligation. It is also expected that they are more likely to accept an advice from a human than from a machine.

There has been research on trust and the familiarity with the device which showed that people trust an unfamiliar device less (Shneiderman, 2007). In this study and in the case of predictive policing, people are not familiar with the decision-aid. For this reason, it is expected that trust in humans will be higher than in a machine.

With regards to the type of advice, it is expected that trust will be higher in the choice condition, as humans tend to believe in their own decision (Gino, 2008).

Further, it is hypothesized that feeling of authority mediates the association between trust in the advisor and the chances of following an advice.

Method

Design

Data was collected using a 2x2 between subject design. There were two independent variables which were the type of advisor and the type of advice. The two levels of type of advisor were advice from a human co-worker or from a computer system. The variable type of advice also had two levels, namely an evaluation of the situation in which they were free to choose their action and a obligatory advice, which stated that they had to perform a specific action.

The dependent variables were trust and the chances of going to area A. Both were assessed in the four conditions to investigate differences in trust with regard to the advisor and the type of advice.

The mediating variable was level of authority to measure the association between trust in the advisor and the chances of following the advice.

Participants

A total of 82 people participated in this study (65 female, 17 male; mean age = 20.89, SD = 2.87). From these 82 participants, 60 were German, 15 Dutch and seven were of another nationality.

Materials

Chances of actually going to the advised area were measured by a combination of five questions. On a scale from 0 to 100 they were asked how high the chances were that they would go to area A, how certain they were of their decision, in how far they would follow this advice again, whether they were satisfied with the advice and to what extent they had

the feeling to have enough information on the situation. This advice-taking scale was highly reliable (5 items, $\alpha = .83$).

To measure the level of trust, the participant had to indicate on a scale of 0 to 100 in how far they trusted their advisor.

To assess the participants' feeling of authority, a subscale of the Moral Foundations Questionnaire was used, namely the subscale for authority/respect. The subscale authority/respect consists of five statements ($\alpha = .68$). It measures respect for traditions and obedience to authority. The five statements had to be rated on a scale of 0 to 100. The first three statements had to be answered in the light of whether they were relevant when deciding if something is right or wrong ("Whether or not someone showed a lack of respect for authority"; "Whether or not someone conformed to the traditions of society";" Whether or not an action caused chaos or disorder"). For the other two questions, agreement had to be indicated ("Respect for authority is something all children need to learn" and "Men and women each have different roles to play in society").

Procedure

Participants were able to participate in one of two ways. They either participated through the Universities' website for psychological studies, or they received a link through social media by which they could enter the survey. The survey was available both as a desktop and a mobile version. Prior to actually participating, thus filling in the questionnaire, each participant had to read the informed consent. They were informed that all information was gathered anonymously and that their voluntary participation could be stopped at any given time. By proceeding with the questionnaire, they stated that they had been informed about the procedure, understood it and agreed to participate. They then saw the opening screen,

which described the upcoming scenario, in which the participant had to image to be a police officer.

They were asked to image that they are almost done with their shift and are looking forward to a party that their partner is throwing. After this, they were assigned to one of four conditions. First, they were assigned to one of two types of advisors. They either received information on a risky situation from another police officer or from a system. Both type of advisors then gave an advice on the situation. Second, they were assigned to one of two types of advice, specifically choice or obligation. In the former, the advisor stated that area A was at risk as a crime might happen during the next two hours, In the latter, it stated that they had to go to area A, because a crime might happen during the next two hours. They were then asked what they would do in that situation. They had to indicate the chances of going to the area at risk. Finally, they were asked to give some general information, namely their age, gender and nationality.

After the participant finished the questionnaire, he or she received some information about the background and the purpose of the study. They were thanked and an email address for further information was provided.

Results

Descriptive Statistics

In this study, we wanted to investigate whether people trust a human advice more than a system advice and under which circumstances the level of trust changes. The overall level of trust was M = 71.12 (SD = 19.25) on a scale from 0 to 100.

Following the scenario, it was also asked in how far the participant would go to the area at risk and thus follow the advice. The mean was 63.59 (SD = 18.13) also on a scale from 0 to 100. Additionally, it was assessed in how far the feeling of authority played a role in trusting and following advices. The overall level of feeling of authority was M = 53.26 (SD = 17.09), again on a scale from 0 to 100.

In order to investigate a possible mediation of feeling of authority, a correlation with both trust and advice-taking is necessary. The analysis showed that there is a weak correlation between authority and advice taking (r = .33; $p < .01$) and a slightly weaker correation between authority and trust (r = .28; $p < .05$), as can be seen in table 1.

Table 1.

Descriptive statistics and correlations

		N	*M*	*SD*	1.	2.	3.
1.	Advice taking	82	63.59	18.13	-	-	-
2.	Feeling of Authority	82	53.26	17.09	.33**	-	-
3.	Trust	82	71.12	19.25	.75**	.28*	-

*$p < .05$. **$p < .01$

Advice-taking

An ANOVA was used to investigate whether levels of advice taking differed between the types of advice, namely obligation and choice and types of advisor. It was expected that participants were more likely to accept an advice and go to area A when it was a choice and not an obligation. Further, it was expected that chances of advice taking, thus going to area A would be higher in the human condition than in the machine codition.

The main effect for type of advisor was not significant (F (1,80) = 2.22; p = .140), but the effect for type of advice was marginally significant (F (1,80) = 3.67; p = .059), which means that the type of advice has an effect on advice-taking, regardless of the type of advisor. However, the interaction effect was not significant (F (1,80) = 0.12; p = .726), which suggests that there is no combined effect of type of advisor and type of advice.

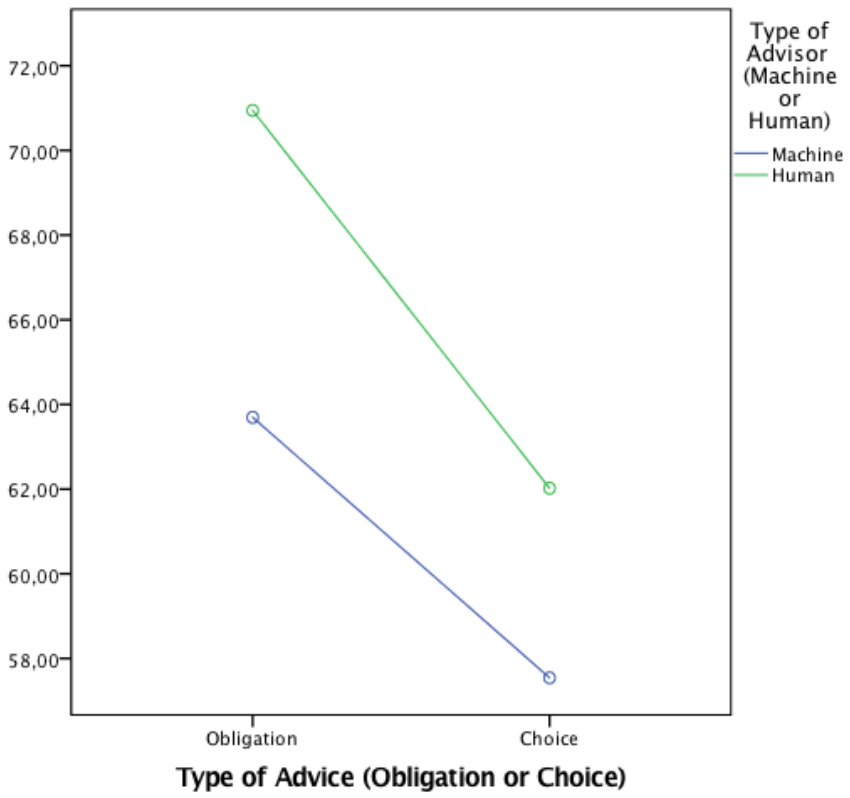


Figure 1. Effect of Type of Advisor and Type of Advice on Advice-taking

Trust

An ANOVA was used to investigate whether levels of trust differed between the types of advice, namely obligation and choice and types of advisor. The main effects for both type of Advisor (F (1,80) = 4.00; p = .049) and Type of Advice (F (1,80) = 4.50; p = .037) were significant, which means that both have an effect on advice-taking respectively. Trust was higher in the human advisor and in the obligational advice. However, the interaction effect was not significant (F (1,80) = 0.99; p = .324), which suggests that there is no combined effect on advice-taking.

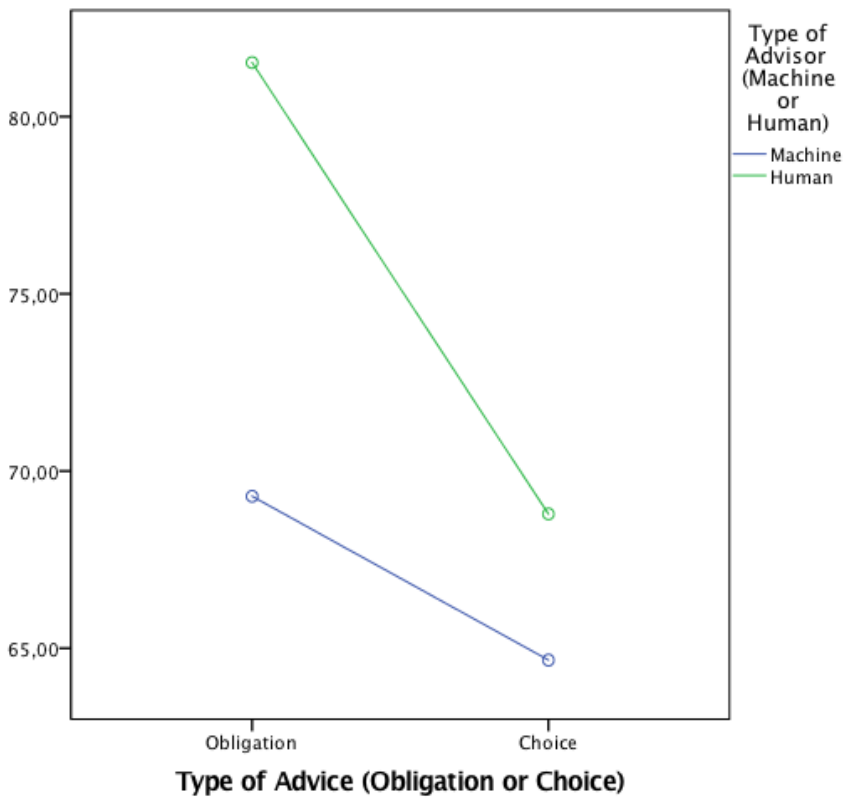


Figure 2. Effect of Type of Advisor and Type of Advice on Trust

Mediation Authority

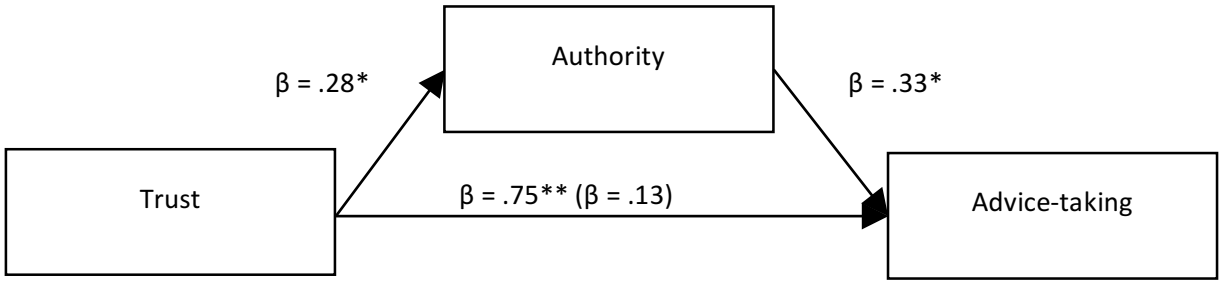
To assess whether the relationship between trust and the chance of taking the advice was mediated by authority, regression analysis was used. The analysis showed that level of trust and chances of taking the advice were positively associated ($\beta = .75$, $t(80) = 10.01$, $p < .001$). Table 2 shows the associations between the independent variable trust, the mediator authority and the dependent variable advice-taking. It shows that trust was significantly associated with authority ($\beta = .28$, $p < .05$). Authority was also significantly associated with chances of advice-taking ($\beta = .33$, $p < .05$).

Table 2. Mediation analysis for trust (independent variable), authority (mediator) and going to area A (dependent variable)

Trust *(IV to mediator)*					***Advice-taking*** *(Mediator to DV)*			
β	*SE*	*t*	*p*		*β*	*SE*	*t*	*p*
.28	*.09*	*2.58*	*.012*	*Authority*	*.33*	*.11*	*3.10*	*.003*

Regression analysis was then used to assess whether authority mediates the effect of trust on Advice-taking. The results however did not support this assumption

($\beta = .13$, $t(80) = 1.7$, $p > .05$). Figure 3 shows a graphic display of the results.



* = p < .05. ** p <.001

Figure 3. Regression coefficients for the relationship between trust and advice-taking as mediated by authority. The regression coefficient between trust and advice-taking, controlling for authority, is in parentheses.

Discussion

It was hypothesized that advice-taking differs between types of advisors, specifically that advice was more likely to be taken from a human than from a machine. The results showed that this was not the case in this study. This hypothesis was therefore not confirmed. Earlier research has shown that people rely on their own beliefs when they view them as superior to others (Gino, 2008). The questionnaire was filled in by students, who are probably unfamiliar with making decisions as a police officers and therefore relied on the machine. Another possible explanation is that there is indeed no difference between acceptance of an advice from a human compared to a machine. As shown above, there are many other factors which might influence advice-taking, that the type of advisor might not play such a big role.

Further, it was hypothesized that advice was more likely to be taken when it was a choice compared to when it was an obligation. However, this was also not confirmed. On the contrary, the results showed that advice was more likely to be taken when it was an obligation. This finding is not in line with previous research by e.g. Dalal & Bonaccio (2010) which showed that people perceived an obligational advice as limiting and as a threat to

their self-esteem. However, other research on situational factors has revealed that choosing between options can increase cognitive workload (Stefanou, Perencevich, DiCintio, & Turner, 2004). A possible explanation could be that people favor the obligational advice over the choice advice to avoid cognitive workload. Another possible explanation is that students did not feel comfortable to make such a decision and did not want to take responsibilty for it. Research by Stefanou, Perencevich, DiCinto and Turner (2004) has shown that the feeling of responsibility can indeed have an effect on decision-making.

The study showed that there are different levels of trust with respect to the type of advisor. People indeed trusted the human more than the machine. This hypothesis was thereby confirmed. Based on the literature it could not definitely be concluded that people trust a human more than a machine, because there has not been a lot of research on this specific topic yet. Existing research on trust showed that it depends on different factors if people choose for the human or machine advice. Possible factors are for example how the person evaluates his or her own capability of making a decision (de Vries, Midden, & Bouwhuis, 2003), whether the consequences of acting upon the advice were satisfying (Bisantz & Seong, 2001) or on how familiar a person is with a device. Although the current study did not investigate the factors that influence trust, it did show that people trusted humans more than machines.

Furthermore, the results showed that trust was higher for the obligation than for the choice type of advice. The hypothesis on trust in the type of advice was thereby not confirmed. As stated above, participants were not familiar with neither the work of a police officer nor with the use of decision aids. The reason why they trusted the obligation more, could be that they relied on the “expert” advice, as they did not have enough expertise to make an informed decision themselves.

Moreover, it was expected that authority has a mediating role on advice taking. Up to this point, there has not been much research on the specific role of authority on advice-taking, but the literature suggested a link between authority and adhering to superiors and social norms, which was supposed to be linked to accepting advice (Graham et al., 2012). However, the mediating role of feeling of authority was not confirmed by the results.

Some strengths and limitations of this study are worth mentioning. One of the study's limitation could be the formulation of the type of advice level. In the obligation type of advice, it was stated that the participant had to go to the area at risk. In the choice type of advice, it was only stated that area A was at risk as a crime might happen during the next two hours. This does not represent a choice between options, strictly speaking. It is only implied that the options are going or not going. For future research, the differences in the formulation could be more precise.

Another limitation is the fact that the study was conducted with students, not real police officers. Students are not used to making this kind of decision and thus miss the long-time experience of making such decisions. A real police officer may have evaluated the situation completly differently. Although this study was conducted to find underlying patterns of advice-taking generally, an analysis with real police officers should be conducted, as they are the ones who will use Predictive Policing in the future.

A positive aspect of the study is the fact that it is one of the first which tries to get some insight into the acceptance of different kind of advisors, types of advices and a possible role of feeling of authority. Although not all hypotheses were confirmed, it provided some useful information.

The present study was already able to shed some light on the underlying factors of decision-making and advice-taking in HCI. However, much more research needs to be done.

As stated above, participants preferred an obligational advice rather than a choice. Future research thus needs to focus on why people actually prefer the obligation and why they trust it more. Furthermore, it should be investigated why there is a discrepancy between the significantly higher level of trust in the obligation and in the human advisor but nevertheless no significant acceptance of the advice. Possible interfering factors that lead to not taking the obligational advice should be investigated. One possibility is the personality of the user that interferes with actually taking the advice. This study was not able to show a link to feeling of authority, but there might be many other personality factors that influence advice taking and trust. One interesting possibility is the level of self-esteem, as those people might feel most threatened by an obligational advice (Dalal & Bonaccio, 2010), closely linked to this is the level of autonomy, which might show the same result (Stefanou, 2004). Once there is some more insight into these factors, trust in the machines' advice can be improved by tailoring the machine to the individuals' personality.

With regard to the implementation of decision-aids such as Predictive Policing, future research also needs to focus on the design and usability of such a device. In Predictive Policing, the advice is also presented in a heat-map. The impact of this visual cue should also be subject of further research in order to maximize use and acceptance of the advice.

Conclusion

The aim of this study was to find the underlying factors that influence advice-taking. These findings can then be used to facilitate the design, use and acceptance of decision-aids like in the case of predictive policing. This study provided some insight into the preferred type of advice, namely obligational advice and it showed that advice is still more acceptable when it is provided by a human.

References

Bahner, J. E., Hüper, A. D., & Manzey, D. (2008). Misuse of automated decision aids: Complacency, automation bias and the impact of training experience. *Internationa l Journal of Human-Computer Studies*, *66*(9), 688-699.

Bisantz, A. M., & Seong, Y. (2001). Assessment of operator trust in and utilization of automated decision-aids under different framing conditions. *International Journal of Industrial Ergonomics*, *28*(2), 85-97.

Dalal, R. S., & Bonaccio, S. (2010). What types of advice do decision-makers prefer?. *Organizational Behavior and Human Decision Processes*, *112*(1), 11-23.

de Vries, P., Midden, C., & Bouwhuis, D. (2003). The effects of errors on system trust, self-confidence, and the allocation of control in route planning. *International Journal of Human-Computer Studies*, *58*(6), 719-735.

Dzindolet, M. T., Peterson, S. A., Pomranky, R. A., Pierce, L. G., & Beck, H. P. (2003). The role of trust in automation reliance. *International Journal of Human-Computer Studies*, *58*(6), 697-718.

Gino, F. (2008). Do we listen to advice just because we paid for it? The impact of advice cost on its use. *Organizational behavior and human decision processes*, *107*(2), 234-245.

Graham, J., Haidt, J., Koleva, S., Motyl, M., Iyer, R., Wojcik, S. P., & Ditto, P. H. (2012). Moral foundations theory: The pragmatic validity of moral pluralism.

Haidt, J., & Graham, J. (2006). Planet of the Durkheimians, where community, authority, and sacredness are foundations of morality.

Lee, J. D., & Moray, N. (1994). Trust, self-confidence, and operators' adaptation to automation. *International journal of human-computer studies*, *40*(1), 153-184.

Lieberman, H. (2001). Interfaces that give and take advice. *Human-Computer Interaction for the New Millenium*, 475-485.

Norberg, P. A., Horne, D. R., & Horne, D. A. (2007). The privacy paradox: Personal information disclosure intentions versus behaviors. *Journal of Consumer Affairs*, *41*(1), 100-126.

Prinzel III, L. J., DeVries, H., Freeman, F. G., & Mikulka, P. (2001). Examination of automation-induced complacency and individual difference variates.

Singhvi, A., & Russell, K. (2016). Inside the self-driving Tesla fatal accident. *The New York Times*.

Shneiderman, B. (2007). Human responsibility for autonomous agents. *IEEE intelligent systems*, *22*(2), 60-61.

Shneiderman, B. (2016). Opinion: The dangers of faulty, biased, or malicious algorithms requires independent oversight. *Proceedings of the National Academy of Sciences*, *113*(48), 13538-13540.

Skitka, L. J., Mosier, K., & Burdick, M. D. (2000). Accountability and automation bias. *International Journal of Human-Computer Studies*, *52*(4), 701-717.

Smit, S. K., Vries, A. D., Kleij, R., & van Vliet, P. J. (2016). Van predictive naar prescriptive policing: Verder dan vakjes voorspellen.

Smith, M., Szongott, C., Henne, B., & Von Voigt, G. (2012, June). Big data privacy issues in public social media. In *Digital Ecosystems Technologies (DEST), 2012 6th IEEE International Conference on* (pp. 1-6). IEEE.

Stefanou, C. R., Perencevich, K. C., DiCintio, M., & Turner, J. C. (2004). Supporting autonomy in the classroom: Ways teachers encourage student decision making and ownership. *Educational Psychologist*, *39*(2), 97-110.