

Towards fundamental models of radicalization

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Abstract. This paper proposes a multi-agent based model of radicalization, based on the theoretical framework from Kruglanski et al. (2014). The model combines the need for significance with ideology and social group theory, in order to create radical behavior. With this model a first attempt is made for a fundamental model that can be used to get better insights in the mechanism behind radicalization. Results show that agents do radicalize and that this leads to the formation of isolated social groups. Furthermore, results show that radicalization does not just depend on a deviating mental attitude, but is a combination of individual and context characteristics.

Keywords: Radicalization · Terrorism · Need for significance · Ideology · Social groups · Social simulation.

1 Introduction

Within the field of research on terrorism one of the major questions is why and how people become terrorists.

Finding the answer is not easy, because there is no clear definition of what terrorism is (Bakker and van Zuijdewijn, 2016). The main reason for lacking a definition is pointed out in the famous saying "one man's terrorist, is another man's freedom fighter", i.e. the description on what terrorism is depends on the context and who answers the question. Furthermore, it is also not clear when someone can be labeled as a terrorist. For example, is a suicide bomber a same kind of terrorist as someone who supports a terrorist organization, but does not participate in their activities? Can someone, who once was a terrorist, get rid of this label? Or is he a terrorist for the rest of his life? Not only does a lack of a definition influence the understanding of radicalization, but also on how and if terrorist can be deradicalized.

This paper is a first attempt towards a model of radicalization, in order to get better insights in the process of why and how people become terrorists. The why in this question is focused on the motivation of terrorist. People are not born as terrorist, so there must be a type of motivation for them (Hudson, 1999). The how refers to the process of radicalization towards terrorism, since one does not become a terrorist in a day.

On both the motivational aspects as the process of radicalization a lot of research has been done. However, most research concentrates on personal triggers or circumstances that trigger the radicalization, like age, education level or social-economical status Hudson (1999). Besides the fact that these factors do not say anything about personal drivers, it also does not give an insight on how the mechanism of radicalization works.

In Kruglanski et al. (2014) a theoretical framework is proposed that shows how the combination of personal motivation and social context triggers the process of radicalization, which can eventually lead to violent behavior or terrorism.

Terrorism is an example of radical behavior. At the same time, suicide, anorexia or severe crime are examples too. Within the framework of Kruglanski et al. (2014) radical behavior is explained as behavior that helps reaching one personal goal, the focal goal, but at the same time undermines goals that matter to other people. Where normal behavior tries to find a balance between reaching different goals, radical behavior is typically focused on one goal, which is called a motivational imbalance.

Anorexia is an example of motivational imbalance in the sense that he or she is focused on becoming better looking and therefore acts in order to loose weight. By not eating at all, however, the universal goal of keeping oneself healthy is suppressed.

According to Kruglanski et al. (2014) looking at radical behavior in this way has two important implications. First of all degrees of radicalism can be measured by the difference in commitment on the focal goal and the undermining of other goals, i.e. motivational imbalance. Now radicalization can be explained as the process of becoming radical, from a low degree of motivational imbalance towards a higher degree. Within this process the commitment towards a focal goal becomes stronger and people are more and more willing to perform extreme or even violent actions.

Secondly, the subjective manner on what is radical behavior is captured by seeing radicalism as motivational imbalance. The definition of what is important or normal depends on the norms and values of social group, i.e. a family, company or a nation. For instance, in the Netherlands democracy and protecting it is one of the core values of the nation. However, this does not hold for all nations. This means that anti-democratic behavior is seen as radicalism in the Netherlands, but not in all countries.

Using this definition of radicalism, clearly terrorism is an example, with the undermined goals being protecting the democratic order (AIVD, 2019), killing others or even killing oneself. Now, the question of why someone becomes a terrorist is a matter of finding the personal focal goal that is shared among them. Although the goal of an extremist group is mostly political related, this is mostly not the personal motivation of people that leads to radicalization.

According to Kruglanski and Fishman (2009) the personal goal of a terrorist is the need for significance which can become a focal goal and create a motivational imbalance. This need is an abstract, universal drive in people that makes that individuals want to achieve something or do something good with others

acknowledging this. If someone experiences a big loss in this feeling of being significant or important he wants to do something to get this feeling back. Only when the commitment towards regaining significance is extremely high, someone becomes willing to perform radical and even violent behavior (Kruglanski et al., 2014; Atran, 2016).

Secondly, what actions are appreciated and will give someone significance are described in the ideology of a group. This means that depending on the ideology of one's social group one will act in different ways. When someone is introduced to an ideology that approves extreme and violent behavior in order to gain significance, and the need for significance is high enough, this can potentially lead to violent radical behavior.

Thirdly, a person will only change his behavior towards a new ideology if there is some relation between that person and a member of the group acting according to that ideology. This makes that social groups and relations are an important factor in the process of radicalization too.

In order to get a better insight on how these three components influence radicalization, a multi-agent based model is proposed that, with the use of a simulation, can test the above theoretical framework and help understanding the mechanism behind radicalism. In chapter 2 a broader theory of the concepts is given. Chapter 3 discusses related work and chapter 4 describes the proposed model. Chapter 5 contains the validation with some results and the paper is ended with conclusion and discussion.

2 Theoretical background

2.1 Need for significance

According to Kruglanski et al. (2014, 2013) the need for significance is a universal drive in people to actually be someone, to create a legacy or being acknowledged by others.

Kruglanski et al. (2013) mentions that this drive can be interpreted as the concept of self-love, introduced by Jean-Jacques Rousseau. This self-love is in contrast with love of the self, which is about taking care of yourself. According to Maslow's pyramid of human needs, the personal care is a higher need than the need for significance. However, Kruglanski et al. (2013) argues that these two needs are equally important.

A loss in significance can be caused by individual experience, like a divorce or infertility, but also in a social context, for example when a group someone feels related to gets publicly humiliated.

A gain in significance can be received in different ways. Acknowledgement is obtained when one acts according to the norms of the group. The feeling of being someone can be obtained by performing actions that results in a positive outcome for the group. This can be something like volunteering in an animal shelter. At the same time, the more unique the actions, the more appreciation. Having the right skill or wanting to do something no one else wants, can lead

to a gain in significance. An example is providing bread as a baker since people need bread and can not make it themselves.

Since someone can only get the feeling of significance from others, performing these actions need to be noticed by other people, even if it is in the long run.

2.2 Ideology

Ideology is a collection of values, attitudes and behavior (Maio et al., 2006). On one hand it prioritizes some values and make some of them absolutely preferred. The latter are called sacred values (Atran, 2016), where people are even willingly to make irrational choices and sacrifice themselves in order to protect this value.

On the other hand an ideology describes what types of behavior are accepted or rejected, in order to live according to those values. This means that the same actions can be interpreted in different ways depending on the ideology. For example, looking at veganism and the Islam as ideologies, the action eating pork is not done and is therefore negatively evaluated in both. Eating chicken is still not done as a vegan, but within the Islam this is a neutral action.

It is possible that people live according to different ideologies, as long as the behavior of one ideology is not in conflict with the other ideology. For example, a conservative will not easily switch to being a liberal, since not only his social group of conservatives will reject him when he changes his behavior, but also people from the liberal party will not easily include him because he used to do actions that are against their norms and values.

2.3 Social groups

A social group is a group of people that interact with each other and behave in a similar manner, according to the norms and values of that group. Social groups come in all kinds sizes, as long as all its members share a same group identity (Tajfel, 2010). Examples are one's family, friends, school or nation.

People belong to multiple groups and have therefore different social identities. Depending on the context, one's identity and the corresponding behavior will become active. For example, someone will behave differently within a group of friends than at work since the rules of how to behave are different. Although people belong to different groups, mostly these groups share common values to avoid conflicting behavior.

When looking at a group as a circle, members can be located at the core or more at the periphery of the group. At the periphery it is easier for a member to switch to other social groups and thereby its behavior. When situated at the core, one is surrounded by other members all behaving in the same way. In that case it will be harder to leave that group, since actions deviating from the norms will be more visible and, possibly, rejected by the core of the group.

Once a social group is surrounded by different groups, its members tend to favor other members of the same group, its ingroup, over members of other groups, the outgroup. This is known as the ingroup outgroup bias. Research

shows that this effect of 'us' versus 'them' can emerge already when people who do not know each other on forehand are divided in different groups. This effect makes that people will not easily switch from one's ingroup to the outgroup.

In extreme situations the ingroup outgroup bias makes that a ingroup becomes isolated. They are convinced that only their norms and values are correct and the members of the other groups are the enemy. In this case there is no periphery in the group with people switching between identities. This strong 'us' versus 'them' effect is a common feeling of members of an extremist group (Hudson, 1999).

Finally, according to Atran (2016); Ginges et al. (2007) joining a new group and adapting to its norms, values and behavior is a process itself, where the identity of an individual becomes fused with the group identity. In case of radicalism, the personal identity is fully replaced by the identity of the group. This could explain why people are willing to sacrifice themselves for the group, like suicide bombers, since they only see themselves as part of that group.

3 Related work

In Shults and Gore (2018) the same theoretical framework is used to build an agent-based model in order to get a better understanding of violent extremism. Although all three concepts of the theoretical framework mentioned in Kruglanski et al. (2014) are taken into account, the actual implementation of them differ from the one proposed in this paper. First of all, the research question is focused on understanding how violent extremism, i.e. a high degree of radicalization, emerges from motivational imbalance.

Secondly, the model assumes that only when the motivational imbalance is below a significance quest threshold, the agent will look for a means to gain significance. However, Kruglanski et al. (2013) explains the need for significance as a need that everyone has, besides the need of taking care of oneself. This means that everybody has some motivation for gaining significance, albeit less committed than others. This can potentially lead to motivational imbalance, rather than the significance quest being a consequence of motivational imbalance.

Finally, gaining significance is directly modelled, instead of through actions and the social surrounding influencing the choice of actions. Since ideology and social groups have a major impact on behavior, this should be taken into account too.

4 The model

This model is a first step towards implementing the radicalization process by using the three concepts need for significance, ideology driven behavior and social groups. The purpose of the model is to show that the combination of a high need for significance, a radical ideology and a social group acting according to that ideology can start the process of radicalization, i.e. let agents perform

actions that undermine goals or values that are important to other agents, and will lead to the formation of isolated social groups.

The implementation is a simplification of the theoretical concepts described in chapter 2.

4.1 Description

The agents in this model are living in a world where the goal is keeping its level of significance as high as possible. The agent can gain significance by performing actions and getting acknowledgement by his social surrounding. How actions can give a gain in significance is defined in two different ideologies. Every agent belongs to a group that acts according to an ideology. In extreme cases the agent can switch to the other group with the other ideology. The social network of an agent consists of the agents' direct neighbors, i.e. between 0 and 8 agents, where its ingroup consists of agents that act according to the same ideology and the out group of agents that act according to the opposite ideology.

The described process is visualized in figure 1.

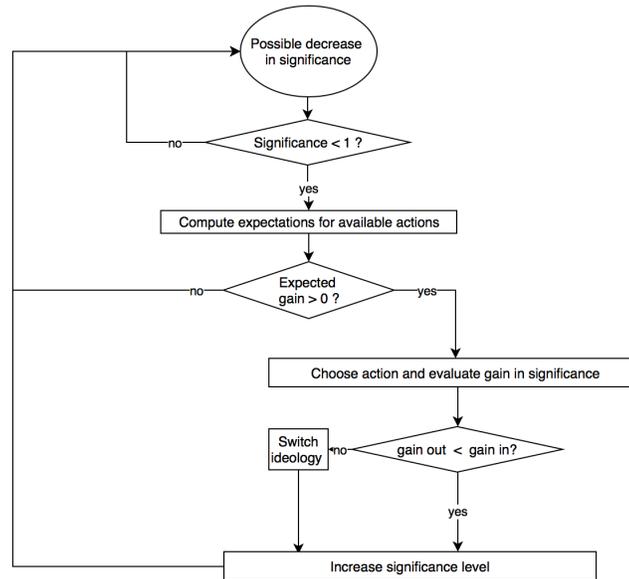


Fig. 1. Model description

Over time the satisfaction level of the need for significance decreases by a decay-rate λ . A low value of significance can be interpreted as somebody feeling

depressed. During the simulation the significance level will be randomly dropped. With a probability of $\frac{1}{5}$ the level will be multiplied with a random value between 0 and 0.8.

The two ideologies I_0 and I_1 available for each agent are an abstract representation of values, norms, cultural traditions and habits. For every available action the possible gain or loss of significance is defined within the ideology. This corresponds to an ideology describing what is good and bad behavior, but also being the means to gain significance. Each ideology describes how much gain one can obtain by performing that action or how much it is rejected, which is shown in 2.

$$\begin{array}{c} a_0 \quad a_1 \quad a_2 \quad a_3 \quad a_4 \quad a_5 \quad a_6 \quad a_7 \quad a_8 \quad a_9 \quad a_{10} \\ I_0 \left[\begin{array}{cccccccccccc} 1 & 0.8 & 0.6 & 0.4 & 0.2 & 0 & -0.2 & -0.4 & -0.6 & -0.8 & -1 \end{array} \right] \\ I_1 \left[\begin{array}{cccccccccccc} -1 & -0.8 & -0.6 & -0.4 & -0.2 & 0 & 0.2 & 0.4 & 0.6 & 0.8 & 1 \end{array} \right] \end{array}$$

Fig. 2. Two ideologies describing the interpretation of actions.

In total there are 11 actions available for the agents, such that it is possible to show shifting towards more extreme actions, but keeping the total number of actions within bounds. The two ideologies are opposites from each other, where the action with the most gain in I_0 gets the highest rejection from I_1 and the other way around. Action a_5 is a default action, i.e. no gain but also no rejection by both ideologies. The ideologies and their actions can be interpreted in many ways. Taking right wing extremists versus liberals for instance, a_0 can be interpreted as hurting foreigners, a_3 defaming them, a_8 giving them jobs, and a_{10} help them fully integrate. Note that in real life there are actions that are positive interpreted in multiple ideologies, but since this model is about radicalization the focus will here be on radical actions and opposite ideologies.

The agent chooses the action with the highest expected gain. The expectations are computed using the rewards within each ideology, combined with a ingroup and outgroup bias. These two bias values are a combination of the number of agents in their ingroup or outgroup and their level of need for significance, and are computed as follows:

$$w_{in} = n_{in} * (S/2) \quad (1)$$

$$w_{out} = n_{out} * (1 - S/2), \quad (2)$$

with S the level of significance and n_i the number of agents in the ingroup and outgroup respectively. The lower the level of significance of the agent, the less positive bias he has towards his ingroup and the more he will look at the number of agents of the two different groups that can give him a significance gain. This correspond to an agent suppressing the norms and values of his ingroup when his need for significance becomes high enough. The expected gain for action i of

agent a is computed by

$$E_i = w_{in} \times M_{i,I_{in}}/n_{a_i,in} + w_{out} \times M_{i,I_{out}}/n_{a_i,out},$$

n_{a_i} the number of agents of the ingroup or outgroup that do the same action. In his way the agent will gain more significance if he performs an action that is less done by others.

To make sure that agents do not choose actions that are in conflict with their previous behavior, they can only choose from the actions that have a maximum distance of two on the scale of radical actions. For example, if an agent performed action a_2 , with a 0.6 evaluation within his ingroup and a -0.6 from his outgroup, the next possible actions are within the set a_0, \dots, a_4 .

In case all actions that an agent can choose from have a negative expected outcome, the agent will perform no action.

Once chosen, the agent will perform that action. In this model this is a trivial step, since action are always successful. Next, the satisfaction level of significance is increased. The gain is computed as follows:

$$\Delta S = \alpha \times (w_{in} \times M_{i,I_{in}} + w_{out} \times M_{i,I_{out}}),$$

with w_{in} and w_{out} the weights of the ingroup and the group, which is a combination of the ingroup bias and the number of agents of that group in the social surrounding of the agent.

When the need for significance is high enough, i.e. his level of satisfaction is too low, his ingroup bias and therefor acting according to the norms and values of his group are suppressed. An agent will perceive the gain in significance of the ingroup as important as the gain of the outgroup. In that case, the actual gain only depends on the number of agents in each of the group and the number of agents actually performing that action. If the increase of significance by the outgroup is higher than that of the ingroup, i.e. if

$$\Delta S_{out} > \Delta S_{in},$$

the agent will switch from group.

5 Results

The above described model is implemented in Netlogo. By running the model, radical behavior should emerge. In this context, radical behavior means agents that perform actions that gives them a major gain in significance, but at the same those actions are rejected by others. Furthermore, the population of agents will split in groups, where agents will be mostly surrounded by other agents belonging to the same group.

5.1 Implementation and initialization

Here, every action can be performed by every agent and will always be performed successfully. Besides increasing the level of satisfaction of agents, the actions

in this model do not have any impact on the environment. At the start of the simulation, the agents are equally divided between the two groups and randomly placed in the grid. The first action of the agents is set to a moderate one, i.e. action a_4 for group 0 and a_6 for group 1, where a gain of 0.2 can be obtained according to their ideology, and -0.2 according to the other ideology.

5.2 Simulation

In figure 3 the results of the simulation are shown. The blue agents are agents that act according to ideology I_0 and the red ones according to I_1 .

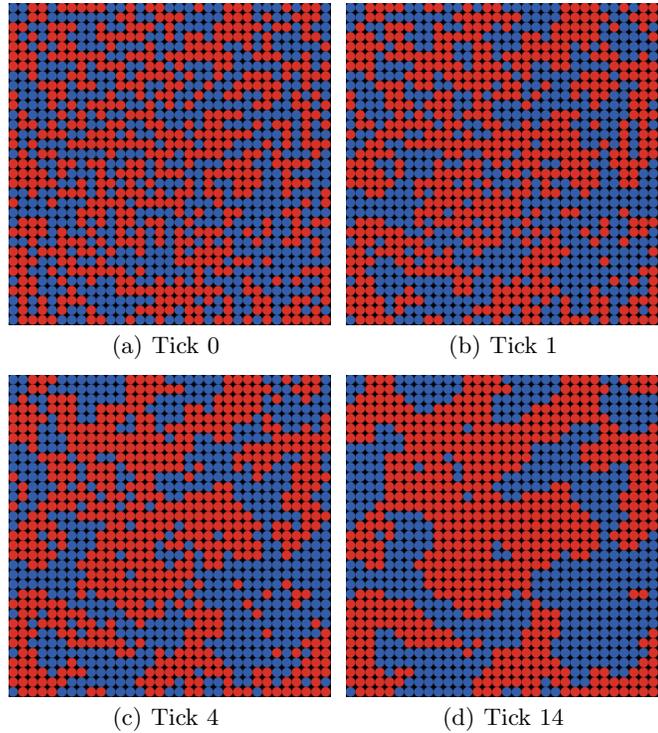


Fig. 3. Runs at tick 0 (upper left), 2, 4 and 14 (bottom right).

The chosen ideology of the agents has converged and they do not switch from group anymore. Clearly, groups of agents have emerged that all act according to the same ideology. This corresponds to the fact that people tend to surround themselves with others who think and act the same.

Agents do not switch anymore, because their actions are too distant from the actions of the other group. This corresponds to two opposing groups whose behavior is so different that it creates so-called social bubbles.

In order to get a better understanding of the behavior of the agents, figure 4 zooms in on different individual scenarios.

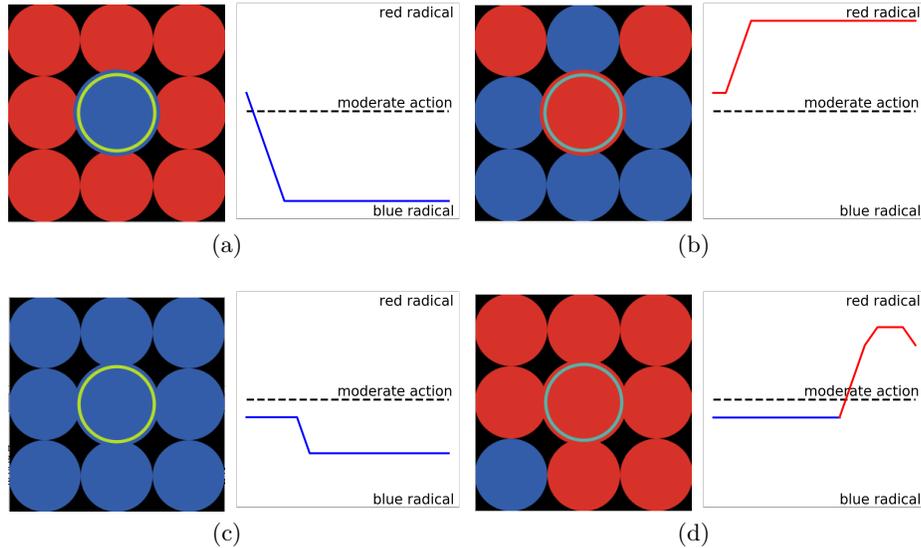


Fig. 4.

Figure a) show a blue agent with no agents from his own group and figure b) shows a red agent with only two neighbours from his own group. Looking at their actions over time, they have radicalized in the sense that they eventually picked the most radical action. In particular the agent at a) can not gain any significance since there are no other blue agents in his surrounding and has therefore a significance level of 0. However, he can not switch to the red group to gain significance from them, because his radical action deviates too much from the actions from the red group. This situation is similar to someone being stuck in a situation without having the possibility to escape.

Agents at c) and d) are mostly surrounded by agents of the same ideology. The agent at d) switched from the blue group to the red group. Compared to the agents at a) and b) their actions are more moderate. This can be explained by the fact that they get enough significance from their surrounding and do not need to fully radicalize. At the same time their actions are mostly seen as positive, since there is (almost) no agent of the other group to reject those actions.

The above results show the start of a radicalization process in the sense that agents choose more radical actions and isolated groups emerge, where agents are not able to switch to the other group. Also, it shows that the circumstances of the social surrounding of the agent play an important role in radicalizing or not and keeping his significance level high enough. If not in the right condition,

agents get stuck and are neither able to gain significance according to their own ideology nor switching to the other group.

6 Conclusion and Discussion

The model is a first implementation of the theoretical framework from Kruglanski et al. (2014) where it is argued that the combination of a high need for significance, an ideology that will function as a means to gain significance and connection to the group that acts according to that ideology leads to radicalization. The results show that groups of radical agents emerge, where radicalizing individuals lead to the formation of isolated social bubbles. It shows the importance of a social surrounding in order to start the radicalization. Furthermore, the circumstances of the agent seem to be important in the sense that not all agents with a low level of significance are able to gain it back. These results do not only support understanding the radicalization process, at the same time they can give insights on why deradicalization is not straightforward as long one can not escape his social group.

In this model the most essential concepts are implemented. However, extensions should be made in order to create a more realistic implementation of the real world. This has to be a combination of actions, goals and values.

For instance, besides the need for significance agents should have the goal to take care of themselves, as mentioned in Kruglanski et al. (2013). Also, in this model the need for significance is fulfilled by acting according to the norms of a social surrounding and therefor 'doing good' and by doing something unique. The latter that agents should have skills that are not commonly shared. In that way agents can perform actions that are needed but not possible to perform by all and gain significance. Furthermore, in the current model performed actions have no consequences. However, a lot of actions do affect others, directly or indirectly, and positively or negatively. Finally, each agent should have his own interpretation of what good behavior is, since ideologies can be abstract. For example, being healthy is a value shared among people, but how to keep one self healthy depends on the interpretation of the individual. By implementing this agents that are stuck in a group and have a low level of significance should be able to start forming their own ideology in order to gain significance. A way of how the combination of actions, values and goals should be modeled has already been introduced by Heidari et al. (2018).

By implementing these concepts different degrees of radicalization should emerge, but also gaining significance in a non radical way. Phenomena related to radicalism, like sacrificing oneself for the group and identity fusion can be studied and will give a better understanding of the mechanism underlying radicalization.

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