

WHEN MOWRER IS NOT ENOUGH - An operant analysis of rumination Olle Wadström (Translated article in *Beteendeterapeuten*, 2013, 1. Pp 12 - 17.)

After writing the book “Quit ruminating and brooding: It is easier to do with Cognitive Behavior Therapy” in 2007 (“Sluta älta och grubbla -- lättare gjort med KBT”) I realized that the behavior analysis which is the foundation for both the book and its treatment recommendations is not self-evident for all CBT therapists. While the book was intended as a simplified guide for the general public I hope that this article will provide a more detailed analysis of rumination.

My intention, in both the book and this article, is to illustrate the usefulness of an operant analysis of behavioral problems arising from respondent conditioning. The analysis will also show how traditional cognitive techniques are often directly unsuitable (inappropriate) for the treatment of rumination.

Behavior analysis of anxiety traditionally focuses on so-called safety behaviors. With Mowrer’s two-factor theory as a starting point, “safety behavior” is considered to be negatively reinforced when it is followed by a reduction in anxiety. While Watson showed how respondent conditioning gave rise to conditioned stimuli, Mowrer explained how “safety behavior” is maintained or even strengthened according to the following formula:

$CS \text{-----} > CR/S^D \text{-----} R \text{-----} S^R$
CS = conditioned stimulus (“trigger”), CR = conditioned response (from the sympathetic nerve system), S^D = discriminative stimulus (which controls the behavior that follows (usually a discomforting thought or interpretation of the situation), R=“safety behavior”, S^R = negative reinforcement (through decrease in or removal of fear, danger, discomfort, etc.)

When behavioral problems are not reinforced neither by flight nor avoidance, associated with a decrease in anxiety, or when respondent conditioning is not present or evident, a straightforward operant analysis is preferable. This means that an arbitrary behavior (R_n) is chosen as the focus of analysis, with a number of possible reinforcers, apart from the reduction of anxiety.

$S^D \text{-----} R_n \text{-----} S^R$

Thus an arbitrary behavior (R_n) of a given client, which is excessive or deficient in some dimension, may be subjected to operant analysis, with the intention of changing it. In order to influence R_n , the analysis must include information about reinforcers (S^R) and discriminative stimuli (S^D).

Despite the fact that severe rumination involves anxiety, I have chosen to use an operant approach for a behavior analysis of rumination. To my knowledge, this approach has not been used earlier and can be regarded as unconventional. An

operant analysis leads to an interesting and decisive conclusion: that exposure with response prevention is the self-evident treatment of choice. The operant analysis results in the same choice of treatment as a strict analysis based on Mowrer's two-factor theory.

In my opinion it is essential to use an operant analysis, since Mowrer's two-factor theory only gives a momentary analysis of rumination, which are (instead) many behaviors which occur repeatedly over a period of time, as a behavior chain.

The question that persons who ruminate ask is why they can't stop ruminating, even if that is what they long for most of all. As a behavior analyst my question is: What reinforces thinking of discomforting, distressing or intrusive thoughts?

Before I examine the operant analysis of rumination I would ask you to consider the following story, which resembles what happens when a person ruminates.

Peter comes home from school and goes looking for his mother. He has been teased by his classmates and now he wonders if this will continue until he becomes the object of their bullying. When he worries about this he has many discomforting thoughts about all the unpleasant things that might happen. One scenario is quickly surpassed by one that is even worse. These scenarios include more and more frightening details the longer Peter talks to his mother. His mother responds to his worry with logical arguments, comforting comments, reassurance and soothing advice about how he should act next time his classmates tease him. In reality she has no magic solution, specific knowledge or inside information that is certain to calm him down.

***Peter:** They tease me and say I have a big nose.*

***Mother:** Your nose isn't bigger than anyone else's.*

***Peter:** They laughed at me.*

***Mother:** Your profile is Grecian and it's beautiful.*

***Peter:** Then they said there was a bump on it*

***Mother:** You should be glad you don't have a little turned-up nose.*

That wouldn't look good on a man.

***Peter:** What if they tease me again tomorrow?*

***Mother:** You'll see that they'll have forgotten all about this tomorrow.*

***Peter:** Chris will be back tomorrow and he's the worst tease of them all!*

Through evolution our brains have adapted to looking for danger and threats. Peter's "scary or warning brain" is continually presenting him with new details that show that the next day can be dangerous. Why does it do this?

The frightening fantasy that evolution has carved out for us has been definitive for the survival of homo sapiens, who is slow, weak and harmless per se. Those individuals who have had the ability to imagine danger before it becomes evident or even close, have more time to plan and take precautionary measures. This ability has favored survival. Better to imagine 999 dangers unnecessarily than to miss the single one that can be fatal.

Evolution is not however reason enough to explain why Peter is constantly thinking about new dangers, why the thoughts are so intrusive. From an operant perspective there must be some reinforcement for Peter's discomfoting or distressing thoughts. An operant behavior - thoughts are operant behaviors - must be reinforced or else it will be extinguished.

Peter's mother's comforting and reassuring answers negatively reinforce Peter's frightening thoughts, which increase, as a consequence. Therefore his brain continues to produce more and more unpleasant and discomfoting thoughts. Why are his mother's reassuring answers reinforcing for Peter? Because they temporarily - extremely temporarily - ease his nagging worry and discomfort. However, his mother's reassurance can only be reinforcing if Peter experiences sympathetic arousal ("fight-flight reaction") when he worries. This arousal is a necessary condition for his mother's comfort to act as negative reinforcement.

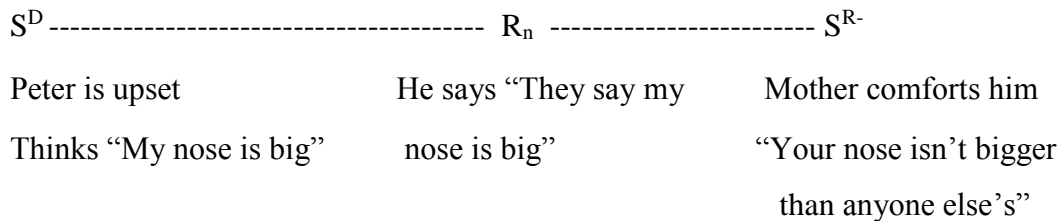
Phenomena which influence the effect of reinforcers are called establishing operations (EO). Establishing operations (or conditions) are any phenomena that strengthen or weaken the effect of reinforcement. Feelings (hunger, thirst, anxiety and illness) as well as values, ideas, or misunderstandings can act as EO for behavior. Establishing operations (EO) originally designated an "operation" in order to increase the effect of a given reinforcer. For example withholding food from an organism increases the effect of food as a reinforcer. Michael's (1982) definition of EO is...

"any change in the environment which alters the effectiveness of some object or event as reinforcement and simultaneously alters the momentary frequency of the behavior that has been followed by that reinforcement"

Worry must include sympathetic arousal in the form of a physiological reaction if Peter's mother's reassurance is to be reinforcing. Without a physiological reaction as an EO, her comments would not have any reinforcing effect on Peter's discomfoting thoughts and questions. These thoughts and questions would thus quickly disappear through extinction.

From Peter's perspective the problem is the excessive occurrence of unpleasant and discomfoting thoughts which he reports to his mother. His goal is to decrease or eliminate these thoughts. A traditional analysis based on Mowrer's theory would focus

on the mother's reassurance as the target behavior. Not so with an operant analysis. The mother's reassuring answers would be regarded as a consequence, which functions as negative reinforcement for Peter's (reports of) thinking unpleasant or discomforting thoughts.



It is important to remember that anxiety, or more preferably the accompanying physiological reactions (the sympathetic nervous system is activated), serve as an establishing operation (EO). Without this information the analysis of rumination is incomprehensible.

Rumination is like an inner dialogue between Peter and his mother.

Let us examine what happens in the brain of a ruminator and compare it with Peter's rumination with his mother. Rumination involves both thoughts that signal danger (discomforting or intrusive thoughts) and thoughts that may constitute potential solutions, hopeful possibilities, explanations or reassuring answers (comforting thoughts).

If a person is threatened or in danger and experiences increased sympathetic arousal (anxiety and stress) and then escapes or solves the situation with "safety behaviors" then the elements which were fought or guarded against can become conditioned stimuli (CS) - respondent conditioning. Conditioned stimuli automatically produce reactions in the sympathetic nervous system.

When a person is threatened or confronted with a problem that lacks an obvious solution then worry, including physiological reactions quickly intensifies through respondent conditioning. If a person with discomforting thoughts tries to generate his/her own solution, explanation or comforting thoughts his/her discomforting thinking will be reinforced. His/her "comforting thoughts" act as "safety behaviors" and momentarily "save" him/her from worry and discomfort. Performing "safety behaviors" when the sympathetic nervous system is activated enables respondent conditioning to occur. Respondent conditioning (also known as classical conditioning) was described by Watson who induced a rat phobia in little Albert. While Albert was playing with a white rat, Watson created a loud and sudden noise (which is universally innately frightening and an unconditioned stimulus UCS) which activated the sympathetic nervous system. Thereafter Albert was rescued from the presence of the rat by removal of it. This made Albert afraid of the rat. The rat became a

concept of behavior chain. Anxiety (including sympathetic arousal) is now an EO which continues to be present and occasionally (intermittently) increases through new respondent conditioning,

With this in mind we can regard rumination from an operant point of view. Regardless of what comforting thoughts turn up in the form of solutions, explanations or last resorts, the scary brain will always be on the look-out for new, related dangers, since no peril can be ignored. To miss a potential threat can be the difference between life and death for a Stone Age man.

Discomforting thoughts are therefore always present, but with partially renewed contents and with an adaption and interpretation which is connected with the current context/situation.

This occurs not only because evolution has provided humans with an innovative scary brain but also because rumination operates as a behavior chain.

A behavior chain is characterized by the fact that the reinforcement for each individual behavior becomes a discriminative stimulus for the next operant behavior (Sundel & Sundel, 1999).

$$S^D \text{ ---- } R_1 \text{ ---- } S^{R+} = S^D \text{ ---- } R_2 \text{ ---- } S^{R+} = S^D \text{ ---- } R_3 \text{ ---- } S^{R+} = S^D \text{ ---- } R_4 \text{ ---- } S^{R+}$$

Let me present another example of a behavior chain from a completely different context: I am sitting at the computer, chatting with a friend. I send my message; this is my operant behavior (R). This behavior is reinforced when my friend's reply appears on my screen. This reinforcement is simultaneously a discriminative stimulus ($S^{R+} = S^D$) for me to resume my writing (R_2). Another example: When reading a text the brain retains part of a line (R_1) until the letters are registered and understood (S^{R+}) making understanding/reinforcement a stimulus (S^D) to focus the eyes on the next section of text (R_2), etc. etc.

Likewise, in the rumination chain, the comforting thoughts which function as negative reinforcement are also a start stimulus (S^D) for thinking about a new dangerous aspect or discomforting thought.

$$S^D \text{ --- } R_1 \text{ ----- } S^{R-} = S^D \text{ ---- } R_2 \text{ ---- } S^{R-} = S^D \text{ ---- } R_3 \text{ ---- } S^{R-} = S^D \text{ ---- } R_4 \text{ ---- } S^{R-}$$

Discomforting thought		Comforting thought		Discomforting thought		Comforting thought		Discomforting thought		Comforting thought		Discomforting thought		Discomforting thought
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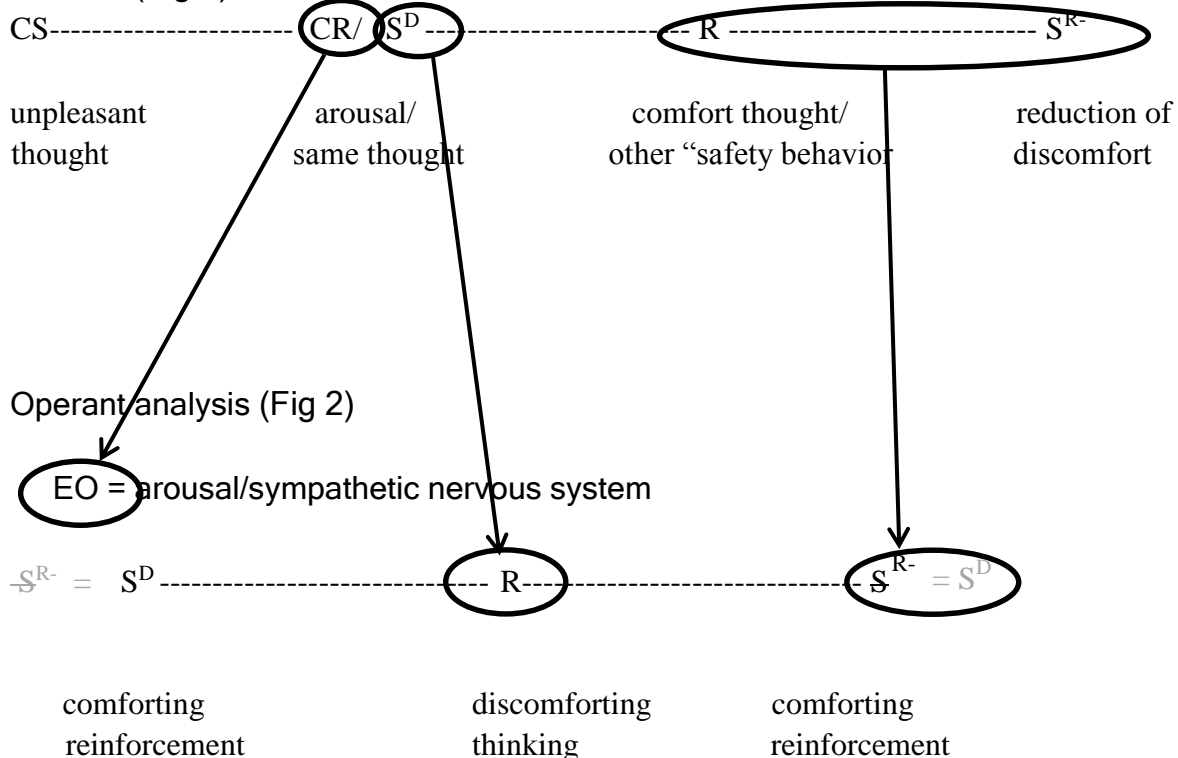
Instead of just relieving worry/anxiety (including arousal), comforting thoughts also become discriminative stimuli S^D for more and new frightening thoughts, which may increase the sympathetic arousal through respondent conditioning.

Applying the same analysis to Peter and his mother then Peter's discomfoting thoughts are R, his mother's reassuring answers are negative reinforcement stimuli (S^{R-}) for Peter's behavior to think discomfoting. Her answers are also a signal (S^D) for Peter's objections - i.e. new discomfoting thoughts (R). Peter simply wants more comfort and more certain answers so that he can feel completely safe. But instead his worry increases, through respondent conditioning.

Summary of the operant analysis of rumination

I choose to make discomfoting thoughts the focus or target of the operant analysis, instead of the more traditional focus on anxiety reducing safety behavior.

Mowrer (Fig 1)



It is amazing that when the goal is to extinguish discomfoting thinking (R) by removing the reinforcement (fig 2), the operant analysis leads to exposure with response prevention as does the respondent analysis (fig 1).

To understand this analysis it is necessary to keep two paradigms in mind, alternating and simultaneously (See Figures). In the first paradigm comfort thoughts (R) are negatively reinforced flight behaviors. In the other paradigm discomfoting thoughts are R and comforting thoughts simultaneously serve as both negative reinforcement and discriminative stimuli ($S^{R-} = S^D$) in the behavior chain.

Treatment of rumination

How then does the operant analysis differ from the traditional? In traditional exposure with response prevention the main intervention is usually to ask patients to refrain from their “safety behaviors” (fight and flight behaviors). On this case these behaviors are thoughts. It is well-known that a decision to not think comforting thoughts, so as not to reinforce discomfoting thoughts, is impossible. As soon as one must think about what one is not allowed to think, the “forbidden” thought is already there. Therefore it is necessary to use techniques with behaviors which are incompatible with thinking comforting thoughts. At the same time it becomes clear through the behavior analysis why these kinds of techniques are effective. The following techniques are all examples of techniques which make it possible to block comforting thinking and consequently make it possible to extinguish the thinking of discomfoting thoughts.

1. Acceptance
2. A gambling attitude - chance
3. Think the worst thought, increase the discomfoting thought
4. Think like a fatalist
5. Defusion (ACT technic)
6. Mindfulness

If these techniques are used in the right way it is impossible to concurrently think comforting thoughts. Acceptance is the common and efficacious component in these techniques.

What role does respondent conditioning play in rumination?

Some arousal from the sympathetic nervous system must occur when rumination first occurs. Later on it must occur intermittently during the actual ruminating so that a high level of arousal can become an establishing operation (EO). Once arousal is well-established as an EO the behavior chain will be automatic, self-propelled or self-generating due to the negative reinforcement of discomfoting thinking in the behavior chain.

Which learning principles form the foundation for the analysis?

1. Respondent conditioning which occurs after fight, escape or avoidance (“safety behaviors”) in the presence of sympathetic arousal. (Watson and Mowrer). The person learns to automatically fear the cause (CS) of escape or avoidance.
2. Negative reinforcement. Comforting thoughts are behaviors that provides temporary relief from anxiety and enables respondent conditioning (occurs through escape/avoidance of discomfoting thoughts).

3. Premack's principle. See point 1 above. (A behavior which occurs frequently can be used to reinforce another behavior). Frequent comforting thoughts are reinforcement for discomfoting thinking. The principle is not discussed in this article.
4. Behavior chain with its characteristic feature that reinforcement is also a discriminative stimulus (S^D) for the next behavior (R), etc. Rumination is a so-called homogenous behavior chain.
5. Shaping topography (i.e. broadening and widening the contents of the discomfoting thinking). Also known as generalization. Mentioned but not discussed in this article.
6. Shaping frequency (increase in number of discomfoting thoughts). Increase in frequency due to the negative reinforcement.
7. Establishing operation. A sympathetic arousal/discomfoting sensation/anxiety acts as an EO throughout the entire rumination behavior chain. If the sympathetic arousal/"anxiety" is not present as an EO then comforting thoughts cannot serve as reinforcement and discomfoting thinking would be extinguished.

Advantages of the operant analysis

In my clinical work I have found that when patients are presented with an explanation of how behavior chains work in the psycho education phase of therapy, they find the concept appealing, easy to understand and applicable to their own problems. This insight acts as an especially strong establishing operation (EO) which makes it reinforcing for them to test the behaviors and methods that I present which are incompatible with comforting thoughts. If a therapist understands the operant analysis then he/she is less likely to fall into the trap of reassuring the patient by logical objections, probability calculations, etc. Reassurances act as a kind of comforting thoughts which come from another person. As therapist one must refrain from actively reinforcing the discomfoting thinking that the patient presents.

Operant analysis is both useful and pertinent in the majority of anxiety syndromes, especially when the course of anxiety contains ruminating elements and is drawn-out, with repetitive "safety behavior", as is often the case with OCD, social phobia, panic anxiety, GAD, anticipatory anxiety, agonized decision-making etc.

The implications of the operant analysis of rumination is presented in depth in my book "Quit ruminating and brooding - It is easier with CBT" together with numerous examples.

Useful metaphor

Think of the "scary brain" as a tennis player who serves thoughts. He serves discomfoting thoughts to the sensible or logical brain which is expected to return the serve with reasonable/good answers. By ignoring the serves and letting them go on past him the player finishes the match more quickly. Who wants to play tennis with someone who never bothers to return the ball?

References

I assume that those who have read the article this far are familiar with the most basic concepts of the psychology of learning and those phenomena which are the foundation of behavior analysis. However I have included here a few references, since I have found that even CBT clinicians sometimes lack the necessary knowledge in operant psychology. Behavior chains and establishing operations are less well known concepts in the psychology of learning that are crucial for the understanding of my analysis of rumination.

Behavior chain

Sundel, M. & Sundel, S (1999): *Behavior Change in the Human Services*. SAGE publications. Inc. s 89-91, (1999).

Sulzer-Azaroff, B. & Mayer, G. R (1991): *Behavior Analysis for Lasting Change*. Wadsworth/Thomson Learning. S 338 – 349.

Establishing operations

Michael, J (1982): Distinguishing between discriminative and motivational functions of stimuli *Journal of the Experimental Analysis of Behavior*, 37, s 149-155.

Sulzer-Azaroff, B. & Mayer, G. R (1991): *Behavior Analysis for Lasting Change*. Wadsworth/Thomson Learning. S 255-256.

Respondent conditioning

Sundel, M. & Sundel, S, (1999): *Behavior Change in the Human Services*. SAGE publications. Inc. s 141- 152.

The implications for the treatment (of rumination) are covered in detail in:

Wadström, Olle: *Quit Ruminating and Brooding – It is easier to do with Cognitive Behavior Therapy*. Psykologinsats 5th edition, 2015. This book can be ordered from Amazon.com ISBN 978 1511549776

Visit www.quitruminating.com

The Swedish edition can be ordered from www.psykologinsats.se

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