The Wrong Face:

contextual framing of facial expressions within pervasive narratives.

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Abstract: The face may very well be the most salient carrier of emotional information. When we want to know what someone is thinking or feeling the first place to look is to their face. However, facial expressions are often ambiguous: for instance, a sad person might be smiling and an angry face might be hiding fear. In such cases additional signals from the body and the voice are required next to contextual cues coming from the environment and the setting of the situation. Over the past decades the science of face-reading has evolved towards a broad contextual view of the driving cognitive processes. The present study aims to explore this further by using the pervasive abilities of puppet theatre to study the salient meaning of facial expressions. The results indicate facial expressions to be of little or no consequences for the attribution of emotions. Even further, contextual framing can cause categorical shifts when viewers attribute feelings of sadness or disgust to a character with a happy face within a 1-minute narrative as if the face were a blanc canvas. Nevertheless, participants score significantly better than chance when remembering the characters faces, indicating these expressions have not gone unnoticed.

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1. Introduction

The face may very well be the most salient carrier of emotional information. However, facial expressions are often ambiguous and additional information is required: "*from the body, the voice and the context (...) to compute the meaning and the behavioural consequences of a facial expression* (de Gelder, 2006)." Contextual elements might also dominate or confuse the perception of an emotional state and the attribution of affect. The perception of an emotional state being the way a participant views and responds to a character, while the attribution of affect refers to the assessment of the characters perspective when asking: 'How would you describe the emotional state of the character?' As a useful heuristic one might say: perception of emotional information is about me (the observer) and attribution of affect is about you (the other). This study focusses on the latter: the attribution of affect. Or, what is the other feeling?

Over the last century series of studies researched both facial expression as a signal that can stand on its own and the reading of facial expressions dependent of context. Although the studies about facial expressions in context were not motived to understand the holistic interactions between multiple sources of emotion information. Rather, they attempted to prove or disprove the notion that facial expressions were clear emotional signals.

In all cases, laboratory conditions of the science practise demand a limitation of variables. Both classic and modern studies that explore the perception of facial expressions in relation to contextual framing use a methodology consisting of single, isolated elements. For example, an often-used paradigm named after the original study by Goodenough & Tinker (1931) presents participants two pieces of information: a portrait photograph representing fear, anger, disgust etc. and a written, single line description as a context. Another format is the pairing of two photographs. For example, one picture showing a facial expression and another showing a bodily expression (Aviezer, 2017). Or, one picture showing a facial expression and another showing a visual context (Righart and deGelder, 2008). In all these examples the researchers offer the participants incongruent paired stimuli (a picture of a sad face paired with a happy storyline) or congruent paired stimuli (a disgusted face paired with a picture of a garbage-dump). The present study uses this same setup: the relation between two elements are weighted by offering participants congruent and incongruent paired situations.

A simple observation inspired by puppet theatre performances is at the core of this research. It was noticed that the fixed facial expression of hand puppets could cause a happy-faced puppet to play in a sad scene while an apparently gloomy character could end up in a happy scene. In these cases, one might say, the puppet has 'the wrong face'. However, the audience is not expecting the puppet to change its expression and doesn't

seem to mind the incongruency. Does this imply that the puppet's face functions as a blanc canvas for the spectator to project the appropriate emotion upon? Or does the viewer rather appraise other sources of affective information?

In the puppet theatre anecdote, the two basic elements are: facial expressions and contextual framing. Much different however, then in the previously mentioned studies, is the weight and the diversity of the contextual attributes. A dramatic scene is built up from the interaction between many different attributes (movement, sound, development, expectations, etc) resulting into a pervasive narrative. The contextual elements in a dramatic scene are more complex and intend to elicit deeper engagement than a single, isolated variable in laboratory conditions. In all, a dramatic scene is assumed to be more corresponding with the rich context in which facial expressions are typically perceived.

The present study is set up along the lines of the puppet theatre anecdote. The participants are asked to view dramatic scenes on video. The narrative is played out by a performing character (a puppet) in the first person singular with a realistic human voice. The viewer is personally addressed by an expressive face that, most of the time, is looking directly into the camera (which comes down to looking participants directly into the eyes). Since the duration of the monologue is one minute it is referred to as a pervasive narrative (the terms pervasion and immersion may be confusing. They refer to both the medium itself and the effect on the audience/user as a diffusing experience (an action and a condition). Pervasive gaming describes a situation in which the game is ubiquitous and omnipresent (e.g. on- and offline, virtual and physical). Pervasion is the hallmark of the medium. Immersive gaming (involving an element of Virtual Reality) primarily refers to the experience of the user (the condition) who is under the impression of being somewhere other than where he actually is. Yet immersive theatre describes a multi-media format (rather than the contemplated experience), much alike a Gesammtkunstwerk. For clarity, however clearly open to debate, in this paper the term pervasive is used to describe a medium for its action tendencies to be present and elicit engagement and the term immersion is reserved to describe the effect, the condition of the viewer). The dramatic abilities of puppet theatre allow to set a life-like balance between contextual framing and facial expressions. Since hand-puppets are typically designed with a fixed facial expression they offer a naturalistic opportunity to use them as a controlled variable.

One of the outcomes shows that in incongruent situations contextual framing can cause categorical shifts in the attribution of affect. Participants attributed sadness and disgust to characters with clearly a happy face and happiness was attributed to characters with a disgusted expression. It is interesting to realize that at the beginning, before the narrative plays out, the expression on the puppet's face is the only source of emotional information. It may hold a predictive quality however the influence of the narrative is not yet experienced. Then, somewhere in the duration of a 1-minute video the attribution of affect shifts from one basic emotion to another. Although this study does not answer questions about time-based attribution of effect it does show the importance of such studies in the future by identifying the moments and causes of the actual categorical shifts

2. Hypotheses

Since the puppet theatre anecdote mentioned in the introduction shows there is no evidential effect when a dramatic scene is played with a puppet who has an incongruent expression (*the wrong face*), the same is expected here. The context is strong and pervasive on one hand and the audience, familiar with the fixed facial expression of a hand puppet, is not expecting any chances on the other. In all reason to formulate the first hypothesis as a negative:

(H$_1$) *The expression on a character's face, when offered in a pervasive context, is of no consequence for the perceived gist of a narrative and the ability to sympathize with the character.*

Despite the negative form of the first hypothesis it is assumed that a congruent scene, a scene where the gist of the narrative matches the expression on the puppets face, makes a stronger impact on the audience. The second hypothesis aims to show a relation:

(H$_2$) *The memory of a character's face is more often correct when the facial expression appeared in congruency with the gist of the context.*

The third hypothesis considers individual differences (see: 3c):

(H$_3$) *The perception and attribution affect in relation to the characters facial expression is depending on personal traits of the viewer.*

3. Context and history

Over the last century scientist researched extensively researched both face reading in isolation and face reading in context. The first is about the perception of facial expressions in isolation (e.g. portrait photography as a testing tool). Here the perception of basic expressions (e.g. happiness, disgust) and variations that encompass a basic emotion, are believed to be relatively immune to contextual influence. It is also believed that specific

emotional categories can be directly 'read out' (bottom-up) from the configuration of the face musculature. Both coding (expression) and decoding (perception) are supposed to remain within the same emotional category. The present study tests the unambiguous coding of facial expressions by using hand-puppets with fixed facial expressions. The results show categorical shifts, when a happy face is being perceived as the expression of disgust.

The subject of the second paragraph is facial expressions in context (e.g. bodily expressions, voice, and objects). It discusses the believed inherently ambiguous and context relative character of expressions. Arguments from this line of reasoning are used in the present study since the starting point is the perception of facial expression in real-life situations.

In the last paragraph of this section the importance to notice individual differences is reviewed.

A. Face reading in isolation

Whether emotions are universal or social is a recurrent issue in the history of emotion study. More than a century ago **Charles Darwin** (Darwin, 1965, 1872) challenged the notion that facial expressions are uniquely human by demonstrating similarities between man and animals. On the basis of his evolutionary theory he concluded that facial expressions are universal. **Paul Ekman** re-investigated Darwin's universality. In a famous research which was conducted in New Guinea together with Wallace Friesen (Ekman and Friesen, 1971), he showed photographs of faces to isolated and pre-literate groups. The results provided evidence in support Ekman's theory of 'basic emotions' which posits a reductionist view that a finite number of affective states can be visually identified across different cultures (happiness, surprise, fear. sadness, anger and disgust combined with contempt). Yet in the same article, Ekman acknowledges that evidence of a cross-cultural element in emotional facial behaviour does not imply the absence of cultural differences. Nevertheless, he argues that emotion is fundamentally genetically determined (Ekman, 1971). Recent research led by **Rachel Jack**, university of Glasgow, has sought to revise Ekman's initial six basic emotions down to four, suggesting that fear and surprise are congruent, as are anger and disgust. The research suggests that four biologically rooted basic signals in time evolve into more complex socially specific and cognitively-controlled emotions (Jack, 2014).

In the early nineties Ekman wrote: "*When I began my study of facial expressions, I thought there was just one question to be answered -are they universal or culture specific? I found more than one answer; different aspects of expression are both universal and culture specific* (Ekman, 1993)." His research in cooperation with Friesen resulted in 1978 in a large pool of portrait photographs. The Facial Action Code (FACS) was derived from an analysis of the anatomical basis of facial movement. The taxonomy can be used to determine the muscular actions that produce each expression in terms of anatomically based action units (see also: paragraph 4A). Half a century earlier the question whether emotions evoke characteristic and unique facial expressions was addressed in a remarkable way by **Carney Landis** (Landis, 1924), a graduate student in psychology at the University of Minnesota. In order to answer the question whether there is one expression commonly used to display, for example, disgust he photographed the facial expression while the participants were engaged in various emotion-evoking situations (e.g., smelling ammonia, reach their hand into a bucket containing slimy frogs, etc.). Anticipating Milgram's obedience experiment by almost forty years he even demanded the participants to decapitate a live rat. The result showed that a wide variety of expressions is used to convey the same emotion: for example the basic emotion 'disgust' when having to decapitate a rat. These results hint towards the existence of emotion families or themes (variations of expression encompassing a basic emotion). "*The characteristics shared by all members of an emotion family constitute the theme for that emotion and are most likely to reflect the contribution of nature* (Ekman, 1993)." The different members of the family are variations around that theme, reflecting the influence of nurture and the particulars of the occasion when the emotion occurs. The former is referred to as 'basic' emotions and the latter 'discreet' emotions which are distinctive but do not necessarily require an evolutionary explanation. Although the terms 'discreet' emotions and emotion 'themes' open up to culture-specific views of expression it is important to notice that both are the bottom-up views in which specific emotional categories and affective dimensions (Carroll & Russell, 1996) could be directly 'read out' from the configuration of the face musculature relatively immune to contextual influence.

At this point it is interesting to mention the concept of 'emotion seeds' suggested by **Hillel Aviezer**, PhD at Hebrew University of Jerusalem. The metaphor of the 'seed' is a useful way to conceptualize similarities between expressions. For example, upturned corners of the mouth are characteristics of both a smile and pain expression. In isolation upturned corners have little impact being a shared physical similarity. The seed remain inert. However when a face is seen in context a seed such as upturned corners (a wrinkled nose or furrowed brows) sprouts as it were and influences the perception of the expression. The disgust concealed in sad faces will not be evident unless activated by the appropriate context: "*these seeds may become highly relevant and "grow" significantly, influencing the perception of the facial expression* (Aviezer, 2008)."

An expression can be more or less similar in terms of face muscular movements with another expression. Each facial expression is confounded to varying degrees with other facial expressions with which it shares physical information. A sad face encompasses seeds of disgust (Smith & Scott, 1997). DeGelder makes a similar observation: "*Components of different facial expressions may resemble each other (...) The role of the context would then be to glue the components together* (de Gelder, 2011)."

Facial expressions that are less similar share fewer emotion seeds. For instance, the observation that individuals expressing disgust may portray looks of anger but very little of happiness, can be computed from the relatively high amount of emotion seeds that anger and disgust have in common. In other words, disgust expressions are highly influenced by an anger context and only slightly influenced by a fear context (Susskind, 2007).

An appealing additional perspective comes from Rachel Jack in the study mentioned earlier. She adds a time based component, the temporal dynamics of facial expression. Latent seeds can evolve in successive categories over time and with different speeds (For example, sadness is a slow emotion while fear is much faster). She argues that "*Not all facial muscles appear simultaneously during facial expressions but develop over time supporting a hierarchical biologically-basic to socially-specific information over time*." So what initiates with an ambiguous nose wrinkle can a little later become a disgusted or angry expression.

B. Face reading in context

"*Facial expressions tend to appear in a context of head and body orientations, body movements, posture changes, and other object-related actions with a similar or at least a closely related meaning* (de Gelder, 2006)."

The categorical shift and the effectiveness of contextual framing is demonstrated by the famous Kuleshov-effect (1912). The effect is named after the Russian filmmaker **Lev Kuleshov**, who showed the audience a shot of neutral face alternated with various other shots (a plate of soup, a girl in a coffin, a woman on a divan). The audience believed that the expression on the actor's face was different each time he appeared, depending on whether he was 'looking at' the plate of soup, the girl in the coffin, or the woman on the divan, showing an expression of hunger, grief or desire, respectively (see Fig 1).

Another method to investigate the question how contexts may influence face processing was used by de Gelder in 2008. She showed participants pictures of
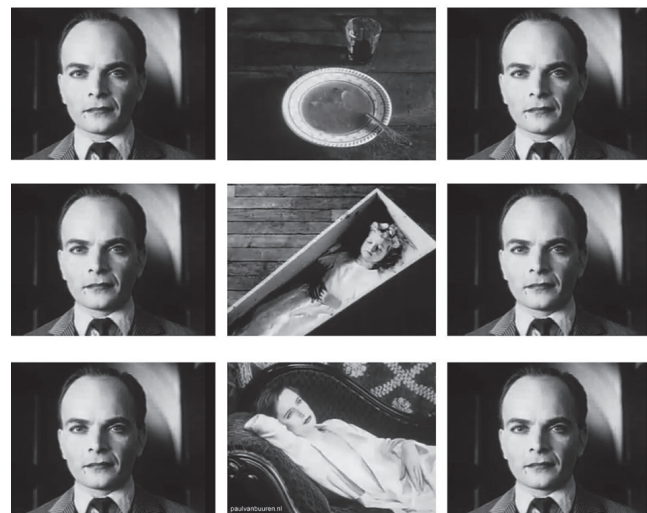

Fig 1 Kuleshov-effect (1912) The neutral face of the actor Ivan Mosjoukine is believed to change in context with other shots.

natural scenes centrally overlain with stimuli consisting of faces (see Fig 2). The results revealed faster response times and higher accuracies for the congruent stimulus pairs, showing that the emotional expression of a face is recognized better when it is embedded in a congruent scene. A procedure developed by Goodenough & Tinker in 1931 combines a short story serving as a context with photographs representing fear, anger, disgust etc. Participants receive two pieces of information: a photograph and a written description. For example, a picture of a smiling face situated in a verbal context in which somebody just heard his best friend died. The researches asked participants to assess what emotion was felt by the character in the story (their results showed that verbal contexts affected the attribution of emotional states). It is important to note that Goodenough & Tinker were interested in emotion attribution , not emotion perception, asking the participants "What emotion is being experienced by this person?" not "What is the facial expression displayed by this person?". This method is often used and referred to as the Goodenough & Tinker paradigm. Both de Gelder (Righart & de Gelder, 2008) and the Goodenough & Tinker procedure use congruent (the affective state of face and context match) next to incongruent pairings as a method. The methodology of the present study is also based on a congruent and an incongruent condition.

Fig 2 Facial expressions of fear, happiness, and disgust were paired with contexts of fear, happiness, and disgust. These pairs could constitute congruent emotions (left)—for instance, a facial expression of disgust in a context of garbage—or incongruent emotions (right)—the same expression, shown among flowers. (Righart and deGelder, 2008).

Aviezer, like de Gelder, makes a strong case about the often-ignored role of context. The inability to read isolated faces and the need for decoding expressions by incorporating contextual cues such as body language is elegantly demonstrated in a paper published in 2012 (Aviezer, 2012). The study uses images of professional tennis players winning or losing a point. Their facial expression during these intense peaks of emotion with opposite affective valence were presented to participants in one of three formats: face alone, body alone, or face with body. The results show (see Fig 3) that the participants failed to rate the affective valence of winners as more positive than the affective valence of losers when seeing the face alone. However, they succeeded when seeing the body alone or the body and the face together. Aviezer concludes: "*Real-life facial expressions are often highly ambiguous, heavily relying on contextual information. (...) context is an inherent part of real-life emotion perception, often leading to radical categorical changes (Aviezer, 2017).*" De Gelder came to a similar conclusion: "*When observing a stimulus that consists of a face and body with congruent expression one might expect that recognition will be 100% correct. But this is not necessarily the case. (...) Without the context information, the emotional valence is ambiguous (de Gelder, 2011).*"

In the present study the expression of the puppets (see 4A. Methodology) is modelled according to the FACSAID taxonomy (Facial Action Coding System Affect Interpretation Dictionary). Two basic emotions, 'disgust' and 'happiness', are modelled according to their exact muscular signature. The encoding makes a clear determination of the emotional state, and yet, they might not necessarily be decoded as 'disgust' or 'happiness'. Some claim, and a few examples have already been given, that real-life facial expressions are inherently ambiguous and can be associated with more than one emotion category (e.g., a facial expression that has an equal chance of being categorized as happy or angry). Aviezer writes: "*It is perhaps not surprising that a recent review of naturalistic studies bluntly described the link between emotion and naturalistic facial expressions as 'very weak, non-existent, or unpredicted* (Aviezer, 2017)." Yet, the puppet faces in this research are modelled according to the precise muscular signature of two basic emotions.

Peter Meineck, Professor of Classics in the Modern World at New York University, is one of the very few to study the role and the importance of the mask within a full and pervasive context. He addresses the question how a mask operates within a visual and affective cognitive field (Meineck, 2011) including all pervasive contextual elements that are part of a 5th century BC Greek theatre performance. His recent book Theatrocracy shows: "*how the mask was not neutral and did not project just one fixed expression as others have argued, but was instead ambiguous, schematic, and a material anchor for affective predictive projection.*" He argues that the mask as an object provides: "*a highly effective material anchor for the audience's own projection of emotion and was capable of displaying a plethora of changing affective states.*"

C. Individual differences

Cognitive biases and differences in reactivity are important determinants of affective experiences. Character traits such as a low or high ability for empathy, affecting the tendency to identify with characters in narratives, might lead to differences in the assessment of facial expressions in a narrative context.

Suzanne Keen, professor of English at Washington and Lee University: "*The acts of imagination and projection involved in such empathy certainly deserve the label cognitive, but the sensations, however strange, deserve to be registered as feelings. Thus, I do not quarantine narrative empathy in the zone of either affect or cognition: as a process, it involves both. When texts invite readers to feel, they also stimulate readers' thinking (Keen, 2016).*"

The present research holds reference to both literature, by the way the vignettes are written, and to theatre in the way the experiment is delivered. And indeed, some participants declared after taking part in the test
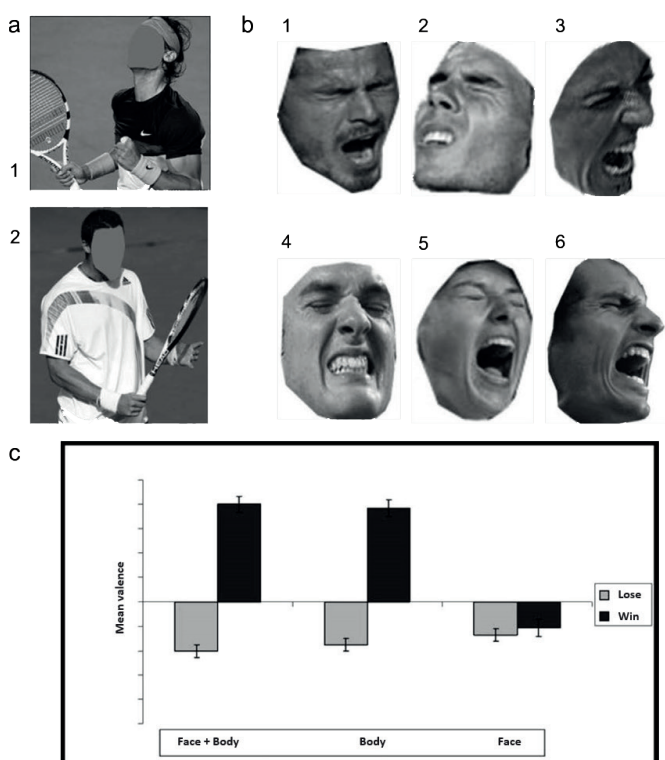

Fig 3 Characteristic body language of (1) winners and (2) losers. (b) Isolated facial expressions of winners and losers in tennis (1, 4, 6 = losing point; 2, 3, 5 = winning point). (c) Mean valence ratings as a function of stimuli format (Aviezer, 2017).

having trouble to keep focus while watching the video's. Their thoughts about the characters and associated fantasies just wondered off. **Amy Coplan**, professor in the philosophy department at California State University Fullerton, mentions this active state from a literary perspective: "Through the process of empathic connection, the reader simulates a character's experience, but because he simultaneously has his own thoughts, emotions, and desires, his overall experience involves more than just that simulation (Coplan, 2004). "

In this study individual aspects of empathy are measured before watching the video's by using The Interpersonal Reactivity Index (IRI) (Davis, I980). Items on the fantasy scale measure the tendency to identify with characters in movies, novels, plays and other fictional situations while the empathic concern scale inquiries about respondents' feelings of warmth, compassion, and concern for others.

4. Methodology

A1. The expression on a character's face

(H_1) *The expression on a character's face, when offered in a pervasive context, is of no consequence for the perceived gist of a narrative and the ability to sympathize with the character.* The first hypothesis is researched in 3 parts. One question is about the perceived gist of the narrative, another about the ability to sympathize with the character and the third about the attribution of a basic affective state.

1 Whether the perceived gist of a narrative is or is not dominated by the expression on the face, a congruent/incongruent comparison test is constructed. Participants are shown videos in which a hand-puppet plays a short narrative. The single character performing in a video has a fixed facial expression (see Fig 4). The choice to use hand-puppets is made because the viewer will not be expecting the expression of a hand-puppet to change. All other aspects are life-like: the narrative is played out in the first person singular with a realistic

Fig 4 Video screenshot: handpuppet with fixed facial expression (original in full-color)

human voice. The viewer is personally addressed by a face that, most of the time, is looking directly into the camera. The background is black without details. The only item different between the two versions of a narrative (two paired videos) is the facial expression of the puppet: disgusted or happy.

Participants are randomised between two conditions. One half watches four videos in which the facial expression of the puppet is congruent with the gist of the narrative. The other half watches video's in which the facial expression is incongruent. After watching each video the participant is asked the question: "In all, how would you label this story? (Q1)" A slider is then offered on which the participant can choose a position between 'very pleasant' and 'very disturbing'. For example: is a performance about 'disgust' perceived as more disturbing when the character has a disgusted expression? And its paired incongruent question: is a performance about 'disgust' perceived as more pleasant (less disturbing) when the character has a happy expression? Not the outcome of these questions in absolute terms is of interest, but what counts is the tendency of the participants to be influenced by (in)congruent narratives when classifying the video.

2 The ability to sympathize is subject of the second question of the survey: "Are you able to sympathize with the character in the video? (Q2)" Again, the tendency of the participant to be influenced by the facial expression when classifying the video is measured. A slider is offered on which the participant can choose a position between 'not at all' to 'very much'. Of interest is to see if the ability to sympathize, shows a response advantage for facial expressions accompanied by congruent scenes.

3 The third question of the survey is about the attribution of affect and asks the viewers to label the emotional state of the character (Q3). The choice is limited to Ekman's six basic emotions: anger, disgust, fear, happiness, sadness and surprise. This is the question that will reveal the tendency for categorical shifts when the attributed basic emotion and the facial expression are incongruent. In a study by Aviezer photographs of bodily expressions and portraits were paired. The result showed the mean accuracy for the disgust faces to be 91% when placed in a disgust context (a photograph showing the bodily expression of disgust), 59% when placed in the fear context and 35% when placed in the sadness context (Aviezer, 2008).

A2. The memory of a character's face

Whether the memory of a character's face is more often correct when the facial expression appeared in congruency with the gist of the context (H_2) is adressed with a memory task. After seeing 4 video's the parti-

cipant, who is not aware of the difference between the congruent and incongruent video's, is asked to choose between two pictures of a puppet. The pictures are almost alike except for the expression on the puppets face: one is disgusted, the other is happy (see Fig 5). Only one of the two was actually seen in the video. The question here is whether the participants are more capable of recalling a face that was seen earlier when that face had appeared in a congruent context. A choice must be made between one or the other when asked: Can you recall the expression of the puppet?
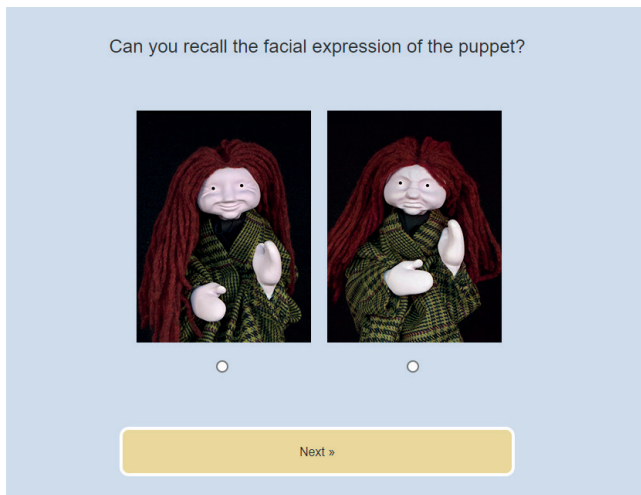

Fig 5   Screenshot from survey - Q4 Memory

A3.   Personal traits.

In order to research the relation between personal traits and the perception and attribution affect (as formulated in the third hypothesis) a self-reporting tool used. In order to address individual aspects of empathy 2 parts of the Interpersonal Reactivity Index (IRI) was added at the start of the survey. IRI defines empathy as the "reactions of one individual to the observed experiences of another (Davis, 1983)." It is a commonly used self-report instrument designed to assess empathic tendencies. It is a four-dimensional index from which we used two in order to limit the number of questions to a minimum (14): the dimension Fantasy (tendencies to transpose into the feelings and actions of fictitious characters in books, movies, and plays) and the dimension Empathic Concern (feelings of sympathy and concern for unfortunate others) (see Appendix, page 16).

Since the survey is available in English and Dutch, a translated and validated edition is used for the Dutch version of the survey (De Corte, 2007). The online survey was done on invitation by handing out an informed consent notice. It consists 14 IRI-questions, 4 videos

Example video's: congruent: https://vimeo.com/252688203; incongruent: https://vimeo.com/252692123 ; password: twf

followed by four questions each and a memory test containing 4 dual-choice questions. The test was done by 105 participants.

It is hypothesized that the outcome of the previous questions, addressing H_1 and H_2, can be related to the outcome of the individual results of the IRI report.

B. Two emotions

The scope of the research allows for only two emotions to be the subject. For clear distinction these two emotions are preferably very different and even bipolar from a dimensional point of view (Rusell, 1983). One face will be the appropriate one and is congruent with the atmosphere of the narrative while the 'opposite' expression will be the wrong face. Although happiness can be seen as the opposite of sadness, Ekman's basic-six-model is not dimensional as, for example, the "wheel of emotions" developed by Robert Plutchik is, suggesting eight primary bipolar emotions: joy versus sadness; anger versus fear; trust versus disgust; and surprise versus anticipation (Plutchik, 1980). Other dimensional models offer suggestions for polarized combinations like 'pleasantness–unpleasantness', 'attention–rejection' and 'level of activation' (Schlosberg, 1954). The bipolar dimension from 'conductive' (content, satisfied, friendly) on one end to 'obstructive' (disgust, contempt, angry) on the other (Scherer, 2005) holds a promising combination yet none of them present guiding principles for visual design.

The circumplex model of affect introduced by Rusell suggests that emotions are distributed in a two-dimensional circular space, containing arousal (activation - deactivation) and valence (pleasant – unpleasant) dimensions (Rusell, 1983). Rather than categorizing directly into specific emotion categories, Rusell convey values read out from the facial expression. Nevertheless, the model holds the ability to plot categorical basic emotions. As mentioned before, Ekman and Friesen constructed the Facial Action Coding System (FACS) as a manual for interpreting every anatomically possible facial movement and expression (Ekman & Friesen, 1978). An update was published in 2002 (Ekman & Friesen, 2002). Emotion-specified expressions are not part of FACS. FACS itself is purely descriptive. By converting FACS codes to EMFACS (Emotional Facial Action Coding System) or FACSAID (Facial Action Coding System Affect Interpretation Dictionary) face images may be coded for emotion-specified expressions (e.g., joy or anger) as well as categories of positive or negative emotion (Kanade, 2000). Only emotion-related facial muscle actions are listed in FACSAID (Ekman, 1998).

A choice is made for 'happiness' and 'disgust' for being at the same level of arousal yet opposites on the

axis of valence according to Rusell's model and offering clear design principles as listed in FACSAID.

C. Narratives

A vignette is a short, impressionistic piece that focuses on a single scene and on one element, mood or character. A vignette aims to evoke emotion. Although the Goodenough and Tinker paradigm is considered to present vignettes they hardly resemble a pervasive scene in a theatrical way. They offer the participants a one-line text written in the third person singular; for example: 'he just heard his best friend died'. 'We choose to write four new vignettes. Two labelled 'disgust' and two labelled 'happiness'; none of them longer than 100 words and all in first person singular (see Appendix, page 14).

Another major difference from the Goodenough and Tinker paradigm is the performing of the text by a life character (contrary to the use of portrait pictures). The text is 'told' by the character with a realistic intonation. Although the stories are about disgust and happiness, the gist doesn't have to be disgusting or happy. That should depend on the viewers perception and the influence of the characters facial expression. A character saying: "I disgust myself", might be perceived as primarily sad. Due to extensive rehearsing the tone of voice moved from an originally literary text to a more parlando script thus adding to the naturalistic expression. The vignettes by themselves, as a written text, are not validated.

D. Visual design

For each narrative two puppets are required. One with a disgusted expressing and one looking happy. The design guidelines to sculp the exact muscle signature are offered by the FACSAID taxonomy: happiness (action unit 6 and 12), disgust (action unit 9, 15 and 16). (See Fig 6). Everything else must be the same.

The first heads were made in the traditional way by using paper mache (See Fig 7). Although dried pa-
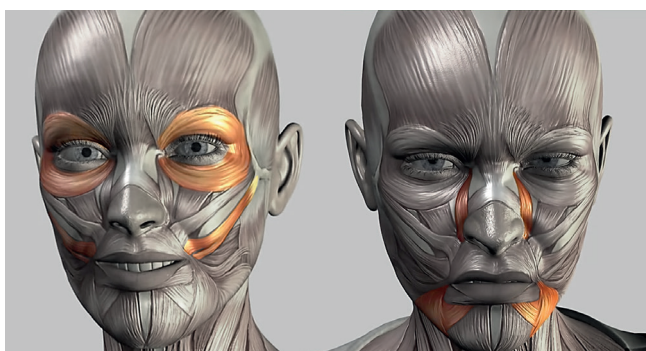

Fig 6   FACSAID Happiness - Disgust
Edited from https://www.youtube.com/watch?v=Lsj7Wvuneoo
Carl Glittenberg, Lilith: Virtual Patient: Face Muscles, 2010

Fig 7   Tradional paper mache

per mache can be sand down to an exact shape even the smallest deviation seem to lead to new and unwanted expression. This method turned out to be unsuccessful and very labour intensive.
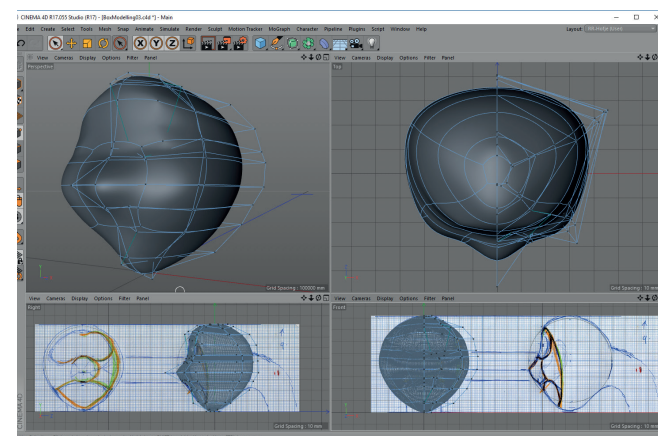

Fig 8   Basic design 3D print

The next attempt was done by using a 3D design program (Maxxon Cinema 4D R17) and 3D printing (Cura Ultimaker 2 Extended). The idea was to print a 3D basis as a neutral face and then later add the muscle signature by hand using paper mache (See Fig 8).

Again, the smallest deviation between to two paired puppet heads lead to a difference in expression. Even a very thin paper mache skin to work with could not prevent this. In the following series more details were add to the 3d print and less to paper mache adjustments (See Fig 9). Eventually the use of paper mache

Fig 9   Mixed materials: basis 3d print – details paper mache
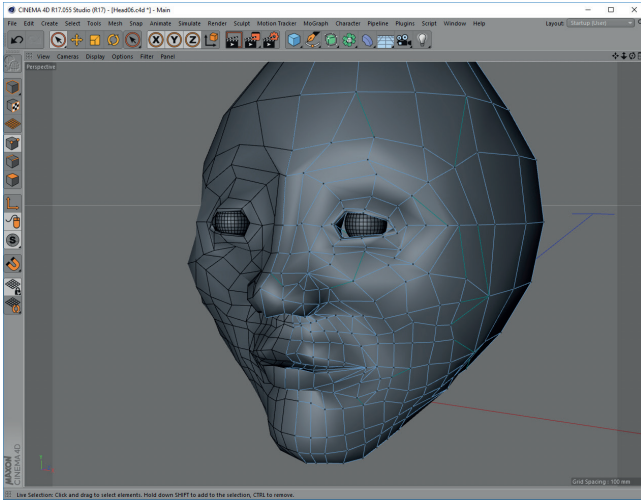
Fig 10   Full detailed 3D design

was abandoned all together including the use of it to sculp the muscle signature. It meant the sculpting had to be done entirely by 3d programming (See Fig 10). It demands quit a bit of practice, not in the least because of the difficult relation between expressive and in-the-face

Fig 11   too 'human' (left); approved puppets (right)

computer screen model and the down to earth plastic printouts. Usually the 3d print was dull and inexpressive in comparison to the computer model on the screen. A number of models were needed to establish the measure to witch to exaggerate the features in the computer model to get a similar expressive plastic puppet.

Only after dressing the first couple another acquirement came to light (see fig 11). Since this study is about human facial expression the puppet heads in all series were based on the human anatomy. However, placed on a hand-puppet this looked ridiculous. Strangely enough the naturalistic puppet-head looked very unreal in context with a puppet-dress and hands without fingers. In other to mimic a realistic situation where a human is talking is talking to you using a puppet, a puppet's head is required. The first pair that was approved had it features exaggerated to right amount to be expressive and was clearly enough a theatre character to blend in the narrative and the video. Besides that, the paired puppets are exactly alike except for 2 or 3 muscles groups (see fig 12). The 3D printed heads are 10 centimeters height on average.

Obviously, the dressing of the happy puppet and the disgusted one is exactly the same. Eyes and hands are the same on all puppet's cross narratives. Eight puppets were made in total. They were not validated for their expression.

5.   Results and Evaluation

After excluding 19 participants with missing mandatory data, the test results of 105 participants were available. For 102 participants 55 (53.9%) were male and 47 (46.1%) were female and age ranged from 18 to 80 (M = 35.72 SD =13.10). Analyses were conducted using SPSS Statistics 23. The answers to questions in the survey (1-4) were not normally distributed so non-parametric testing was used to investigate the hypotheses.

Q1, Q2: Four videos were followed by the question "In all, how would you label this story?" from very pleasant to very disturbing. In condition A the facial

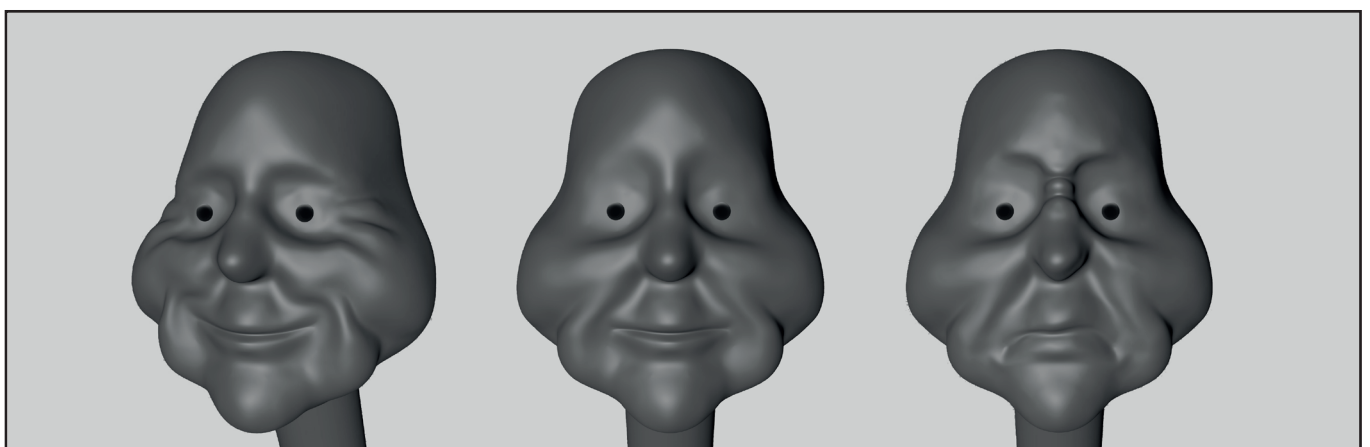**Fig 12**   Happy   Neutral   Disgusted

Happiness:
Cheek Raiser: orbicularis oculi (pars orbitalis) (AU 6)
Lip Corner Puller: zygomaticus major (AU 12)

Disgusted:
Nose Wrinkler: levator labii superioris alaeque nasi (AU 9)
Lip Corner Depressor: depressor angulioris / triangularis (AU 15)
Lower Lip Depressor: depressor labii inferioris (AU 16)

Table 1. Differences condition A and B

	Q1		Q2		Q3	
	U(104)	p	U(105)	p	U(102)	p
Video 1	1268,5	0,596	1300	0,621	1256,5	0,741
Video 2	1343	0,964	1315,5	0,693	1259,5	0,768
Video 3	1212	0,368	1295,5	0,601	1195	0,397
Video 4	1148,5	0,19	1216,5	0,303	1066	0,059

No significant differences were found between the congruent and the incongruent condition.

expression of the character is congruent with the context; in condition B it is incongruent. For all the four video's there was no significant difference between the two conditions (U (104) = 1268,500, p = 0,596; U (104) = 1343,000, p = 0,964; U (104) = 1212,000, p = 0,368; U (104) = 1148,500, p = 0,190, for the four videos' respectively), confirming the first part of the first hypothesis that the expression on a character's face is of little or no consequence for the perceived gist of a narrative (see Table 1).

Similarly, no significant differences were found with the second question, phrased as: "Are you able to sympathize with the character in the video?" (U(105) = 1300,000, p = 0,621; U (105) = 1315,500, p = 0,693; U (105) = 1295,500, p = 0,601; U (105) = 1216,500, p = 0,303, for the four videos' respectively) confirming the second part of the first hypothesis that the expression on a character's face is of little or no consequence for the ability to sympathize with the character.

Q3: The third question: "How would you describe the emotional state of the character?" offers a choice between Ekman's basic-six-emotions (Angry, Disgusted, Scared, Happy, Sad and Surprised). Again, no significant differences between conditions were found (U

Table 2. Cathegorical shift

	Video 1	Video 2	Video 3	Video 4
Attributed	Disgusted	Sad	Disgusted	Happy
Congruent Actual face	60,4% (disgusted)	58,5% (happy)	73,6% (disgusted)	75,5% (happy)
Incongruent Actual face	65,3% (happy)	59,2% (disgusted)	61,2% (happy)	59,2% (disgusted)

Contextual framing can cause categorical shifts when viewers attribute feelings of sadness or disgust to a character with a happy face as if it were a blanc canvas. For example, in Video 1 and video 3 of the incongruent condition a character with a happy face is believed to be disgusted.

(102) =1256,500, p=0,741; U (102) =1259,500, p=0,768; U (102) =1195,000, p=0,397; U (102) =1066,000, p=0,059; for the four videos' respectively). Interesting to note there is a consensus about the primary emotion between condition A and B (see Table 2).

Q4: After watching all four videos and responding to the previous questions, the viewer is asked to choose between two pictures of a puppet when asked: "Can you recall the expression of the puppet?" The puppet looks happy on one photo and disgusted on the other (see Fig 5). Only one of the two was actually seen in the video. The comparison done by a Mann-Whitney U Test (U (99) = 1042,5, p = 0,148) between the two conditions proved the second hypothesis, whether the participants are more often correct when recalling a face that had appeared in a congruent context, to be false.

Since there is a 50% chance for every choice to be answered right, chance to guess a specific amount of questions right can be represented by the black line (see Fig 13). In order to be able to compare chance with the results of each of the two conditions, chance scores were simulated. For example, the chance of guessing 1 question correctly out of 4 is 25% which translates into a
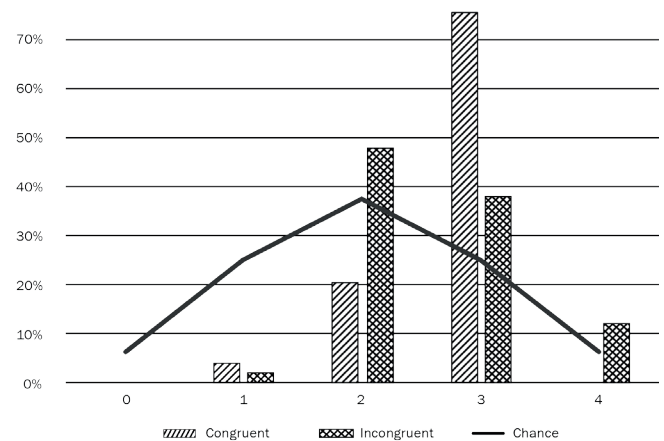
Fig 13 Conditions versus chance. Memory question (Q4)

specific time '1' when the number of participants is given. Subsequently two Wilcoxen Signed Rank Tests indicated that people in both the congruent and incongruent condition scored significantly better than chance on recalling faces of puppets that were shown in the videos' (Z (48) = 3.933, p = .000; Z (49) = 2.975, p = .003, respectively).

6. Interpretation

No significant difference was found between the two conditions in regard to question 1 (labelling the story) and question 2 (ability to sympathize with the character). The same conclusion could be drawn by the results of the third question about the emotional state of the character. Finally, the memory question showed no significant difference between the congruent and the incongruent condition. In general, the results indicate that facial expressions, when offered in a pervasive context, are of little or no consequences for the perceived gist of a narrative and the ability to sympathize with the character. Thus, confirming the first

hypothesis: *the expression on a character's face, when offered in a pervasive context, is of no consequence for the perceived gist of a narrative and the ability to sympathize with the character.*

When asked to describe the emotion of the character in the video there were little or no differences between the congruent and the incongruent condition. However, contextual framing can cause categorical shifts when viewers attribute feelings of sadness or disgust to a character with a happy face as if it were a blanc canvas. These shifts can be seen in video 1 and video 3 of the incongruent condition where a character with a happy face is believed to be disgusted. In video 4 of the incongruent condition happiness is attributed to a character with a disgusted face. These findings confirm the anecdote mentioned in the introduction: in these cases, one might say, the puppet has 'the wrong face'.

The memory questions indicated that people in both the congruent and incongruent condition scored significantly better than chance when remembering the characters faces, indicating these expressions have not gone unnoticed. It is safe to conclude that the faces are not being ignored however: the memory of a character's face is not more often correct when the facial expression appeared in congruency with the gist of the context. Thus, disconfirming the second hypothesis: *the memory of a character's face is more often correct when the facial expression appeared in congruency with the gist of the context.*

Since facial expressions when offered in a pervasive context, are of little or no consequences for the perception and attribution of affect, no dependencies can be related to personal traits of the viewer. The third hypothesis: *the perception and attribution affect in relation to the characters facial expression is depending on personal traits of the viewer* remains inconclusive.

7.   Discussion and Conclusion

The results of this study show that the participants did pay attention to the facial expression of the character, but that this had no effect on the perceived gist of a narrative and the ability to sympathize with the character. The most likely explanation for this is that the perception and attribution of emotion was completely dwarfed by the dominance of contextual elements. Compared to other studies, the contextual framing was exceptionally strong and 'in-the-face', due to the pervasiveness of the video's. Strangely enough Ekman suggest to reduce the contextual presence to a lower level to weigh the relative dominance of the face: "*If one wished to reach meaningful conclusions about the relative dominance of the expression of the face versus the emotion induced*

by the context in which they appear, then both sources would need to be equally strong* (Ekman et al., 1972)." Carroll and Russell address the issue when differentiating between the presence of more or less salient stimuli. They criticise the Goodenough-Tinker paradigm where no results are found in favour of contextual dominance. Here the participants receive two pieces of information: a photograph of a facial expression and a written description of a situation. They question whether visual material is more salient or more easily grasped than written information (Carroll & Russell, 1996). The face may be the most salient carrier of emotional information; yet the perception, the de-coding of the expression, is strongly influenced by the context in which facial expressions appear even to a point where the expression seems to shift from one basic emotion to another. In the past century the field has been dominated by the isolation-context debate. We believe the dynamics of perception and categorical shifts in attribution of emotion are the most promising subjects for further study. The procedure, using hand-puppets with fixed facial expressions, offer a great opportunity for real-time tracking of perception while a video is playing. This could answer questions about when the expression appears to be changing slightly and under which conditions categorical shifts can be identified.

In the present study the expression on the character's face is modelled according to the FACSAID taxonomy. They have the exact muscular signature to represent a specific basic emotion. Thus, according to theory, the expression is not ambiguous, nor neutral or blank. However, are they unmistakable perceived as the expression of basic emotions? The results suggest they are not. The matter to what degree the puppet-face, used in this study, is ambiguous or unambiguous is important since the ambiguity opens the face, so to speak, for multiple interpretations. Meineck proposes that the ambiguity of the Greek mask allows it to seemingly change its expression depending on the actor's body posture and gestures. About a mask of Herakles as depicted on the Pronomos vase he writes: "*it is far from neutral, but it is ambiguous – we are unable to pin a distinct emotion on it, and this ambiguity helps gives the mask its transformative power* (Meineck, 2017)." He also addresses the issue from a theatre-maker perspective: "*It can greatly hinder the ambiguous quality of the mask if the mask-maker makes a determination of the emotional state of a character before making the mask.*" The art historian Ernst Gombrich noted that the ambiguity of an expression is important, not neutrality. You are never sure what Mona Lisa's smile entails. Thus, expressive ambiguity in faces leads to increased spectator engagement. Yet, determining the emotional expression on forehand is precisely what is done in this study since the puppet faces are modelled according to the muscular signature of two basic emotions. In all, it is important to notice that the effect of context on

behaviour identification increases with the ambiguity of the facial expression and decreases with the ambiguity of the context (Trope, 1986). It would be an interesting line of inquiry for further studies to research the ability of a face to function as a blank canvas in relation to the features being neutral, unambiguous or ambiguous. This could also be of importance for the field of affective computing for example when designing an artificial companion or a robot: should it look neutral (e.g. artificial, staying clear of the uncanny valley), expressive (e.g. friendly) or ambiguous to give it its *transformative power*?

Limitations:

Since the survey was done on-line there was no control over the circumstances. The instructions asked for a quiet surrounding and told the participant that the experience is enhanced by wearing a headphone or earplugs. About 35 participants did the survey in a controlled classroom setting.

Although designed according to specific guidelines no validation of the expression on the puppet face was carried out. It would have been interesting to see whether the expressions in isolation leads to the expected perception.

Although not necessary per se for the finding of differences between the conditions it could be interesting to validate the gist of the narratives in isolation as a text.

8.   Acknowledgment

9.   References

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Note: The original version of FACS was published in 1978. It was a manual, not an article, available for training as the current manual is. The original version is out of print, and techniques have been modified since then. The 2002 manual is the current version.

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Appendix

Vignette 1

I am an awful man.
No really.

Every day I see the consequences of the suffering that I cause.
I know I'm hurting people.

I sleep poorly.
Scare-wake twitching and quivering but I'm unable to change.

Everyday, over and over again, I'm only myself.

In the morning I dress
and become the man I am in other peoples' eyes:
a nice man.

The last thing I put on is a friendly face.
I leave the house and say: "Good morning".

What a lie
I disgust myself.

Ik ben een akelig mens.
Nee echt.

Dagelijks zie ik de gevolgen van wat ik aanricht.

Ik weet dat ik mensen kwets.

Ik slaap slecht.
Schrik wakker met het zuur in mijn lijf maar ik ben niet in staat om te veranderen.

Elke dag opnieuw ben ik alleen mezelf.

's Ochtends kleed ik me aan
en wordt de man die ik in andermans ogen ben:
een nette man.

Het laatste dat ik aantrek is een vriendelijk gezicht
Ik ga het huis uit en zeg: "Goedemorgen".

Wat een leugen
Ik walg van mezelf.

Vignette 2

Am I happy?

You know… no person lives "for no reason"

everyone plays a part
but that does not mean you have a goal

Often, I'm happy, that is not the point.
Being together, laughing together
but it's always spontaneous; "just like that".

I'm actually looking for something "bigger"
more profound
like a worthy goal.

I just regret that my life does not show consistency;

no necessity.

I'm afraid I will only be really happy, if I am able to die without this regret.

Of ik gelukkig ben?

Kijk, een mens leeft nooit 'zo maar'

iedereen heeft een rol
maar dat betekent niet dat je ook een doel hebt

Vaak ben ik gelukkig; dat is het punt niet.
Samen zijn, samen lachen
maar het is altijd spontaan; 'zo maar'.

Ik zoek eigenlijk iets 'groters'
iets wat ergens naar toe gaat
een doel

Het spijt me gewoon dat mijn leven geen samenhang vertoont;
geen noodzakelijkheid

Ik ben bang dat ik pas echt gelukkig ben, als ik kan sterven zonder die spijt.

Vignette 3

What a disgusting costume. Really.

I bought a nice 2nd hand suit for a reception.

The shop-assistant told me it came straight from the dry cleaner. And indeed, it smelled fresh.

How was it possible then that I found notes in several pockets during the reception?
And annotations?
And if you read them, disgusting!

The previous owner must have been a disturbing piece of shit
A real scum bag

Throughout the reception, the suit felt like a scuzzy skin around me.
As if it attacked me.

In the evening I literary burned the costume.
Yak!

Wat een walgelijk kostuum. Echt.

Ik had voor een receptie een keurig tweedehands pak gekocht;

Volgens de verkoper kwam het zo uit de stomerij;
en inderdaad het rook ook fris.

Maar hoe kan het dan dat ik tijdens de receptie in meerdere zakken briefjes vond?
En ook aantekeningen?
En als je ze las, walgelijk!

De vorige eigenaar van het kostuum moet een ontstellende smeerlap zijn;
Echt, een hufter.

Tijdens de hele receptie zat het pak als een gore huid om mij heen;
Alsof het me aanviel.

's Avonds heb ik het kostuum letterlijk verbrand.
Bah!

Vignette 4

Often, I'm so very happy.
However, it does not come easy.

A sad youth.
No friends, no love.
Not being part of anything,

And always an outsider.

I make a good living
and I'm missing out on nothing
but it means so little to me.
Sadness always seems to be close.

All this changes when I am sitting in the park
with my lunchbox on my lap

Then I smell the seasons
and crumble some bread for the birds.

They know me by now;
They trust me
and they make me so very happy.

Vaak ben ik zielsgelukkig.
Maar gemakkelijk gaat dat niet.

Een verdrietige jeugd.
Geen vrienden, geen liefde.
Het gevoel om nergens bij te horen,

En altijd een buitenstaander.

Ik heb een goed inkomen
en het ontbreekt me aan niets
maar het zegt me weinig
Verdriet lijkt altijd dichtbij.

Dat veranderd wanneer ik in het park zit
Met mijn broodtrommeltje op schoot.

Dan ruik ik de seizoenen
en kruimel wat brood voor de vogeltjes.

Ze kennen me inmiddels;
Ze vertrouwen me
en zij maken me zielsgelukkig.

Interpersonal Reactivity Index (IRI)

1   FS

I daydream and fantasize, with some regularity, about things that might happen to me.

Ik dagdroom en fantaseer, met enige regelmaat, over dingen die zouden kunnen gebeuren met mij.

2   EC

I often have tender, concerned feelings for people less fortunate than me.

Ik voel me vaak bezorgd over mensen die het minder goed hebben dan ik.

3   EC (-)

Sometimes I don't feel very sorry for other people when they are having problems.

Ik heb niet veel medelijden met andere mensen wanneer ze problemen hebben.

4   FS

I really get involved with the feelings of the characters in a novel.

Ik raak echt betrokken bij de gevoelens van de personages in een roman.

5   FS (-)

I am usually objective when I watch a movie or play, and I don't often get completely caught up in it.

Ik ben meestal objectief wanneer ik naar een film of toneel stuk kijk, en ik ga er niet vaak volledig in op.

6   EC

When I see someone being taken advantage of, I feel kind of protective towards them.

Wanneer ik iemand zie van wie wordt geprofiteerd, voel ik me nogal beschermend tegenover diegene.

7   FS (-)

Becoming extremely involved in a good book or movie is somewhat rare for me.

Uitermate betrokken geraken in een goed boek of film is eerder zeldzaam voor mij.

8   EC (-)

Other people's misfortunes do not usually disturb me a great deal.

Nare dingen die anderen overkomen, brengen mij meestal niet van mijn stuk.

9   FS

After seeing a play or movie, I have felt as though I were one of the characters.

Na het zien van een toneelstuk of film, heb ik mij gevoeld alsof ik een van de karakters was.

10   EC (-)

When I see someone being treated unfairly, I sometimes don't feel very much pity for them.

Ik voel weinig medelijden met mensen die oneerlijk behandeld worden.

11   EC

I am often quite touched by things that I see happen.

Ik ben nogal snel geraakt door dingen die ik zie gebeuren.

12   EC

I would describe myself as a pretty soft-hearted person.

Ik zou mezelf beschrijven als een vrij gevoelig persoon.

13   FS

When I watch a good movie, I can very easily put myself in the place of a leading character.

Wanneer ik naar een goede film kijk, kan ik mezelf zeer gemakkelijk in de plaats stellen van het hoofdpersonage.

14   FS

When I am reading an interesting story or novel, I imagine how I would feel if the events in the story were happening to me.

Wanneer ik een interessant verhaal of roman aan het lezen ben, beeld ik me in hoe ik me zou voelen indien de gebeurtenissen in het verhaal mij zouden overkomen.