APPENDICES

Coding Scheme for the Analysis of Moment-to-Moment Parent-Child Interaction

The present coding scheme was developed in order to analyze dyadic interactions between children and their parents[22]. The coding scheme focuses on both the children's and parents' emotional-behavioral experience of each other and of themselves. For the child, the self-experiences included in this coding scheme were used for the analysis of state self-esteem in the present thesis.

Coding of affect includes information from the Specific Affect (SPAFF) coding system (Coan & Gottman, 2007), which is widely used for systematically observing affective behavior during dyadic interactions. In the current coding scheme, adaptions were made in order to distinguish between self-directed affect and other-directed affect. Coding of behavior includes information from Noom et al. (2001)'s framework of emotional, functional, and cognitive autonomy during adolescence, as well as from Savin-Williams and Jaquish's behavior checklist for self-esteem (Savin-Williams & Jaquish, 1981). In accordance with the Grounded Theory (Glaser & Strauss, 1967), descriptions for categories were finalized based on what could be observed in the video-recorded interactions.

The unit of analysis for the current coding scheme is actions and/or utterances. Actions include behavioral actions, posture, and facial expressions, and utterances include verbalizations and their intonation and volume. Because the duration of the actions and utterances are of interest to for the aims in this thesis, the onset and offset of each action and utterance is coded. The coding scheme describes the codes for Self- and Other Directed Affect (Section 1) and Autonomy and Autonomy Management (Section 2). In the subsections (1.1, 1.2, 1.3 and 2.1, 2.2, 2.3 respectively), general instructions are given that apply to the respective coding categories.

[22] This coding scheme is based on the coding scheme developed in De Ruiter, N.M.P. (2010). *Real-time dynamics of global self-esteem in the context of parent-child interactions: A case study*. Master's thesis in Behavioral and Social Sciences, University of Groningen, The Netherlands.

1. Coding self- and other-directed affect

In Table 1, the emotional categories are shown, together with a description of the category, the indicators of the category, and examples of verbal indicators. Note that Figure 1(see below) should be consulted when coding an individual's laugh in response to the interaction partner. This is because a laugh, depending on the context and whether or not the laugh is genuine, can express a positive emotion as well or a way of showing disagreement and invalidation of the interaction partner.

Table 1
Emotional categories and descriptions for both parent and child. [23]

Other-directed affect	**Score**	**Description**	**Indicators[24]**	**Example of verbalizations**
Affection	3	Individual is showing Joy/Interest/Humor *with* an additional element of warmth and love.	Sitting closer / body contact; verbalize affection; while pausing: eye contact and warm smile	*I like talking to you; as long as we're together*
Pride		Individual is showing Joy/Interest/Humor/Affection *with* an additional element of expressing a high opinion/value of the other person and being openly impressed.	Person-directed compliment; responds to interaction partner with wide eyes, raised eyebrows, smile (surprised and impressed)	*You're so smart; wow, I'm impressed*
Joy	2	Individual is overtly enjoying what the other person is doing or saying.	Big smile (teeth showing, smile with whole face); (genuine) laugh	
Interest	1	Individual is expressing acceptance, understanding or interest in the other individual and when they are obviously present in the interaction with the other person.	Eye contact and small (genuine) smile	

[23] The descriptions in Table 1 were derived based on a combination of the filmed interactions themselves and the descriptions from Coan & Gottman, 2007.

[24] In this table all indicators are grouped together for each level of self- and other-directed affect. This was done for the sake of simplicity. During coding, however, a more detailed version of the coding scheme was used, which included different ways of expressing each emotion based on a specific combination of indicators. Contact Naomi de Ruiter for additional information regarding the more detailed version of the present coding scheme (n.m.p.de.ruiter-wilcox@rug.nl).

Neutral	0	Individual is not expressing any emotion while interaction partner is speaking or doing something.		
Disinterest	-1	Individual is overtly indifferent regarding the other person or what he/she is saying.	Averted gaze, turning away from interaction partner; flat tone when responding to interaction partner	
Frustration	-2	Individual is overtly and negatively aroused by the interaction partner. Individual responds with exasperation or annoyance.	Shocked (disingenuous) laugh; whining tone, emphasizing < 2 words in sentence; rubbing face; sighing; trying to end discussion abruptly	*Yeah, yeah, yeah*
Anger		Individual is overtly negatively aroused while/after being offended or wronged.	Raised voice; phony (mocking) smile; wide eyes and raised eyebrows; tense jaw and lips; eyebrows down and together	*"Tsk"*
Contempt	-3	Individual is treating the other as inferior in a hierarchical and condescending way.	Person-directed comment said with non-humorous sarcasm; forced (belittling) laugh and shaking of head; negative comment about interaction partner said in sharp tone; rolling eyes	*You don't even know what you're saying*
Self-directed affect				
Pride	3	Individual is showing joy in what they are saying/doing *and* an element of self-satisfaction is present.	Complimenting self; speaking with raised eyebrows, upright position, and possible smile	*I never get lost; I think I would make a good president*
Self-humor	2	Individual is overtly amused by something that he/she is saying/doing.	Big smile; laugh while speaking; smile or laugh when interaction partner speaks about person being coded (Note: connectedness is *also* coded in this last situation)	
Self-interest	1	Individual is overtly enjoying contributing to the interaction.	Genuine smile while speaking; speaking in excited tone	*I have an idea!*
Neutral	0	Individual is not expressing any emotion while speaking or doing something		

Embarrassment	-1	Individual is overtly showing that he/she is aware that he/she has done/said something that is socially 'unacceptable' (although not morally wrong), and this awareness is connected to a negative experience.	Eyes cast down; soft voice; forced laugh/smile; fidgeting when focus is on self; odd/spastic movement while hesitating	
Sadness	-2	Individual is overtly hurt by the actions or verbalizations of the interaction partner.	Averted eyes; soft voice; small posture; looking like about to cry	
Anxiety		Individual is overtly anticipating a negative response from the interaction partner.	Fidgeting or swaying back and forth after/during invalidation of interaction partner; alert and tense when waiting for reaction from interaction partner	
Shame	-3	Individual is overtly feeling bad after invalidating him/herself, or after acknowledging and accepting the other person's invalidation. The invalidation must refer to something inherently 'wrong' and person-directed.	Speaking in sad and serious tone after/during self-invalidation	*I know I should quit smoking, but I can't*

1. 1 Affect (general)

Within the positive and within the negative ranges, scores are mutually exclusive. For example, anger (a negative score) cannot be scored as well as frustration (also a negative score). As a rule, if two scores within a range (i.e., either positive or negative) are present, the highest score is coded. For example, if an individual expresses frustration with his/her physical posture, while expressing contempt with his/her verbalizations, contempt is coded.

Positive and negative scores, however, can be simultaneous scored for affect. For example, anger (e.g., expressed with facial expression) and affection (e.g., expressed with verbalizations) can be coded simultaneously. These moments are indicative of internal inconsistency, which is later used for the calculation of state self-esteem.

It is important that the timing of the emotional expression is considered in order to determine whether the emotional expression *self*- or *other*-directed affect. This is further described in Section 1.1 and 1.2.

1.2 Connectedness

The concept of *connectedness* stems from individuals' need to interact with, be connected to, and care for others (Ryan & Deci, 2000). Connectedness is scored when the individual being coded expresses an emotion during or directly after the *interaction partner* says or does something. This indicates that the individual's expressed emotion is a function of what the interaction partner said or did. If the individual being coded expresses an emo-

tion while he/she is doing or saying something, connectedness is not scored (as this indicates that the emotion is a function of what he/she did or said). The exception to this rule is when the individual being coded is speaking *about* the interaction partner while expressing an emotion, or asks the interaction partner a question while expressing an emotion. In this situation we can assume that the emotional expression is both self- and other-directed. Therefore, both self-affect and connectedness are scored. It is important that all other-directed affect is indeed directed at the interaction partner, and not at the general task (e.g., speaking in a whining tone when complaining about the task at hand).

1.3 Self-affect

The concept of *self-affect* is based on individuals' current experience of Self, based on how they appraise internal or external information related to the Self (Coan & Gottman, 2007). Self-affect is scored when the individual being coded expresses an emotion during or directly after *he or she* says or does something. This indicates that the individual's expressed emotion is a function of what he or she said or did. Note that (as described above) *connectedness* is scored as well if the individual says something about the interaction partner.

2.3 Overview of coding

In Table 2, the autonomy-related categories are shown, together with a description of the category, the indicators of the category, and examples of verbalizations. Note that Figure 1 (see below) should be consulted when coding an individual's laugh in response to the interaction partner.

Table 2

Autonomy-related categories and descriptions for parent and child separately. [25]

Child Autonomy	**Score**	**Description**	**Indicators**[26]	**Example of verbalizations**
Self-assertion	3	Child holds his/her ground in the face of invalidations (verbal or nonverbal) from the parent.	Rejects parent's accusation; defends own behavior; holds eye contact after being invalidated	*That's not true; I don't think it's bad that I do that*
Confrontation		Child confronts parent with on-task or off-task behavior, either verbally or non-verbally.	Confronts parent regarding something undesirable; stops parent from doing something undesirable	*You should quit smoking; You always do that*

[25] The descriptions in Table 2 were derived based on a combination of the filmed interactions themselves and the descriptions from Coan & Gottman (2007).

[26] In this table all indicators are grouped together for the sake of simplicity. During coding, different combinations of indicators were used to identify different ways of expressing a specific level of autonomy/autonomy management.

Agency	2	Child takes (momentary) control of the interaction. This level of autonomy is a step higher than attitudinal autonomy as it affects the parent as well.	Changes discussion topic; instructs parent; interrupts parent; stops what parent is doing; refuses to obey parent (regarding something trivial; otherwise *self-assertion*)	*Let's move on to the next topic; No, you get your own water*
Attitudinal autonomy	1	Child expresses his/her own attitudes, ideas, etc. within the interaction.	Asks parent a question (note: not for help); corrects parent; disagrees with parent (verbally or nonverbally); contributes idea; expresses opinion; makes decision	*I think…; We could…; No that's not right; Why?*
Neutral	0	Child is not doing or saying anything, or is speaking in neither autonomous nor heteronomous manner.		*Yeah, the next topic was…; Jenna is my best friend*
Attitudinal heteronomy	-1	Child is passive in the interaction and expects the parent to take control over the interaction.	Verbalizes not knowing (note: not relevant for factual information); shrugs; long hesitation; immediately takes back contribution	*I don't know; Oh never mind, that doesn't make sense*
Dependence		Child invites the parent to take control over the interaction at that moment.	Asks parent to take over; looks at parent expectantly instead of collaborating	*I don't know, what do you think?*
Submission	-2	Child *gives up* autonomy in response to the parents' behavior. Not a form of negotiation.	Changes opinion in agreement with parent without being 'convinced'; takes back contribution after receiving invalidating response from parent (verbal or nonverbally)	*Your idea is better; Never mind, that's stupid*
Parental Autonomy management				
Big validation	3	Parent explicitly validates or agrees with what the child says or does and shows recognition of the child's skills or positive attributes.	On-task compliment; goes along with child's idea; admits to being wrong	*I like that; Your idea is better, let's do that; You're right, I didn't think about that*

Small validation	2	Parent shows subtle respect and support for the child's contributions.	Minimal encourager (nodding, etc.); paraphrasing child[27]	*Mm hmm; So you think that we should…*
Encouraging	1	Parent encourages their child to take initiative and to explore a thought, idea, etc.	Allows child to control discussion; open on-task question (Note: not confrontational question beginning with "why?"); closed on-task question aimed at better understanding child (Note: not a challenge)	*Do you think we're finished?; Do you want to start? What do you think?; Like […] or […]?*
Neutral	0	Parent's actions neither challenge nor support the child's autonomy		*Okay, the first question was…; My favorite […] is […]*
Unresponsive	-1	Parent does not acknowledge what child said or did.	Silent after child's contribution; verbally continues after child's contribution but ignoring what he/she said	
Control		Parent steers or limits the child.	Disagrees with child; corrects child; instructs child; makes decision without collaborating with child; changes topic, interrupts child; asks leading question[28] (note: if invalidation, *confrontation*); challenges child	*Yeah, but…*[29]*; We're not doing that; We're finished; Don't you think it would be better if we…? You […] and I'll […]; No, you do that at least once a week*
Confrontation	-2	Parent expresses negative opinion about his/her child or child's behavior.	Confronts child with undesirable behavior; asks child why he/she behaves in un-desirable manner; verbal person-directed criticism	*What I don't like is…; I get annoyed when…'*
Pressure to submit		Parent pressures their child into submitting to their own plans, ideas, etc.	On-task criticism; non-verbal criticism (e.g., laughing when child did not intend to be funny; belittling smile; disgust face); manipulates child with reward	*That's a bad idea; Oh come on, don't you love me?*

[27] Minimal encouragers and paraphrasing are actions that individuals can do to help the interaction partner feel understood and secure in expressing their thoughts, emotions, etc. (Young, 2009).

[28] Young (2009)

[29] Coan & Gottman (2007)

2.1 Autonomy (general)

For autonomy scores, positive and negative scores are mutually exclusive. For example, a parent cannot be coded as both controlling (negative score) and encouraging (positive score) at the same moment. Note that inconsistencies in individuals' expressions can usually be captured by a combination of autonomy-related coding and affect-related coding. For example, a parent may express negative other-directed affect while also expressing support for the child's autonomy. Autonomy-related categories are described separately for the child (Child autonomy) and the parent (Parental autonomy-management), see Table 2.

2.2 Child Autonomy

Autonomous behavior is based on self-determination, free will, and ownership of own behavior and internal control of own behavior within the discussion. Autonomy does not necessarily imply being independent from the other person, but instead, that there is an absence of salient external control of an individual's behavior (an absence of *heteronomy)*. External control can take the form of either punishment or reward. An individual is still self-determined if external forces are *internalized* and *integrated* (Deci & Ryan, 1995). Areas in which individuals can be autonomous are (1) attitudinal, (2) emotional and (3) functional (Noom et al., 2001).

2.3 Parental autonomy-management

Parental autonomy-management refers to the extent to which the parent is supporting versus challenging the child's current autonomy. These two categories are mutually exclusive.

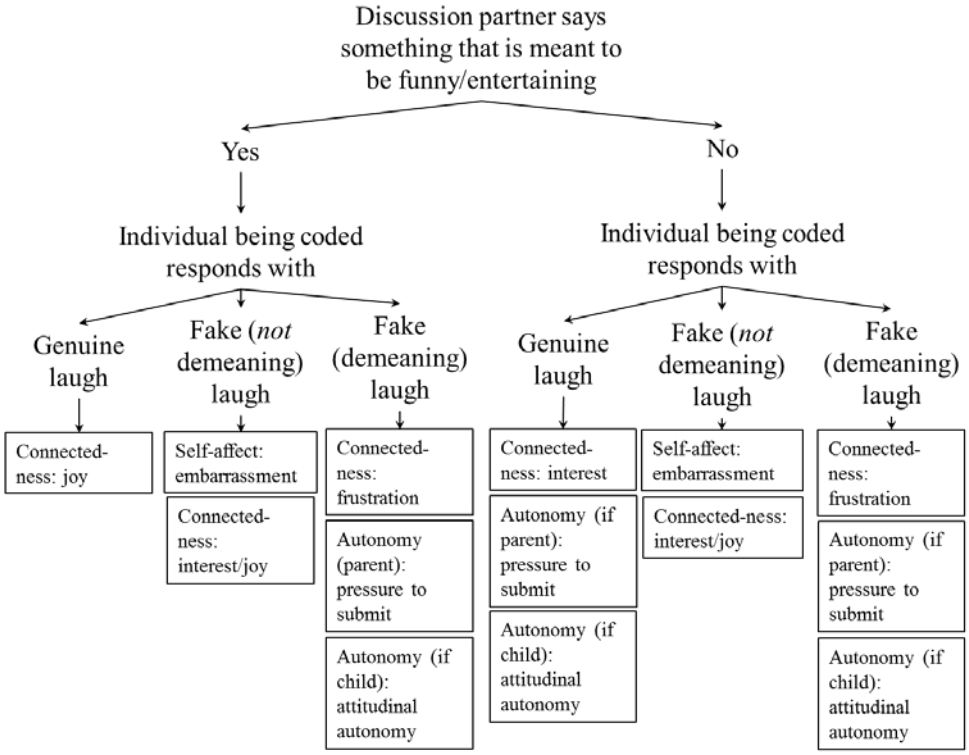

Figure 2. Outline of the affective and behavioral scores given when the discussion partner laughs during the interaction[30].

[30] Coan & Gottman (2007)

References

Coan, J. A., & Gottman, J. M. (2007). The Specific Affect coding system (SPAFF). In J. A. Coan & J. J. B. Allen (Eds.), *Handbook of Emotion Elicitation and Assessment. Series in Affective Science* (pp. 267 – 285). New York, NY, US: Oxford: University Press.

Deci, E. L., & Ryan, R. M. (1995). Human autonomy: The basis for true self-esteem. In M. H. Kernis (Ed.), *Efficacy, Agency, and Self-Esteem* (pp. 31–49). New York, NY US: Plenum Press.

De Ruiter, N.M.P. (2010). *Real-time dynamics of global self-esteem in the context of parent-child interactions: A case study.* Master's thesis in Behavioral and Social Sciences, University of Groningen, The Netherlands.

Glaser, B. G., & Strauss, A. L. (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. New York: Aldine.

Noom, M., Dekovic, M., & Meeus, W. (2001). Conceptual analysis and measurement of adolescent autonomy. *Journal of Youth and Adolescence*, 30(5), 577–595. doi:0047-2891/01/1000-0577

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68–78. doi:10.1037/0003-066X.55.1.68

Savin-Williams, R. C., & Jaquish, G. A. (1981). The assessment of adolescent self-esteem: A comparison of methods. *Journal of Personality*, 49(3). doi:10.1111/j.1467-6494.1981.tb00940.x

Young. M.E. (2009). *Learning the Art of Helping: Building Blocks and Techniques*. Pearson Education: New Jersey.

Summary

1 Research Motivation and Context

Self-esteem has come to be a hugely important concept in modern-day psychology (Zeigler-Hill, 2013). It is often investigated as a predictor for, or an outcome of, other psychological concepts – from academic success to relationship satisfaction (Baumeister, Campbell, Krueger, & Vohs, 2003). In the vast majority of these studies, it is approached as a variable, for which individuals have a score. In psychological research, therefore, self-esteem is most commonly seen as something that distinguishes individuals or groups from each other: Person A has high self-esteem, while Person B has low self-esteem, for example. But what exactly underlies these descriptions? More specifically, what is the nature and the origin of self-esteem? The current thesis aims to answer this question.

Rather than answering this question by approaching self-esteem as something that can be described in the form of a single score, which is then explained by various other variables, as is commonly done (Van Geert, 2014), the current thesis aims to unravel the processes that give rise to, and that characterize, the experience of self-esteem. In traditional self-esteem research, there is not just one 'self-esteem variable', however. Self-esteem can be categorized as being a *trait* or a *state* phenomenon (Kernis, Cornell, Sun, Berry, & Harlow, 1993), and as an *explicit* and an *implicit* phenomenon (Greenwald & Banaji, 1995). This thesis therefore addresses the experience of these four self-esteem constructs specifically.

In order to understand the nature and origin of self-esteem based on the processes that give rise to it, and that characterize it, a complex dynamic systems perspective is adopted. This perspective focuses on how interacting components change across time in order to form emergent complex properties (Thelen & Smith, 1994; Van Geert, 1994). In this thesis, it is suggested that self-esteem is such an emergent property. Moreover, it is posited that the self-esteem property is comprised of three distinct, yet intertwined, sub-levels. These three sub-levels are referred to as the micro-, meso-, and macro-levels of self-esteem, which are distinguished from each other by the time scale across which they are formed.

In this thesis, it is suggested that the most basic level of self-esteem is the micro-level: the positive and negative emotional-behavioral experiences that individuals have regarding themselves in the present moment. Next, at the meso level, state self-esteem occurs. Finally, at the macro level, trait self-esteem emerges. It is posited that these three levels are bi-directionally connected. It is proposed that this bi-directional relationship allows for the *self-organization* of self-esteem, which in return makes each level of self-esteem temporally dynamic, while also giving rise to the temporal self-maintenance of self-esteem.

These propositions are described in the current thesis, creating a theoretical model called the Self-Organizing Self-Esteem (SOSE) model. The model focuses on the dynamics within and between the three levels of the nested self-esteem system. Based on this model, predictions are empirically tested in an adolescent population (N = 13, M (age) = 13.6)

regarding the dynamic nature of state self-esteem and trait self-esteem. Finally, based on the theoretical propositions made in the SOSE model, a classically important distinction between self-esteem phenomena was theoretically explored: the distinction between implicit and explicit self-esteem.

2 Summary of Findings

In Chapter 2, the Self-Organizing Self-Esteem (SOSE) model is presented and further described. We showed how the SOSE model contrasts the traditional approach to self-esteem, in which state and trait self-esteem are part of one construct, and where state self-esteem is conceptualized as the contextual error around latent trait self-esteem. In contrast, the SOSE model posits that trait self-esteem and state self-esteem are distinct constructs that occur on two interconnected time scales. The model outlines how their nature, as well as their relationship with each other, can be conceptualized based on a primary process of bottom-up emergence, where trait self-esteem is an emergent macro-level product of state self-esteem dynamics, and state self-esteem is an emergent meso-level product of momentary micro-level experiences of the self. The model also outlines a secondary process, namely, that of top-down constraint, where the emergence of the higher-order construct begins a process of constraint on lower-order interactions. Together, these form a self-organizing process.

In this chapter, we described that the SOSE model corresponds with an *emergent-causality approach* (Coan, 2010; Schmittmann et al., 2011), which stresses that a higher-order construct emerges out of the interactions between lower-order components. We described that this approach is not usually adopted in psychological research. Instead, a *generative-causality approach* is most commonly adopted, albeit implicitly. In this approach, the phenomenon being studied is approached as a latent trait that generates concrete experiences and actions (Borsboom et al., 2003; Coan, 2010).

We showed that a generative-causality approach is demonstrated in most self-esteem research in either the theoretical or empirical treatment of the relationship between trait and state self-esteem. The former is demonstrated by the common ‘baseline’ and ‘barometer’ approach to self-esteem (Rosenberg, 1979), and the latter is demonstrated by the tendency to aggregate repeated measures of state self-esteem in order to say something about the central tendencies (i.e., mean and standard deviation) of trait self-esteem (e.g., Kernis, 1993). Based on the intrinsic principles of a generative-causality approach – and illustrated by the common scientific studies – we suggested that a generative-causality approach is inherently less equipped to study the intrinsic dynamics of self-esteem, at both the trait self-esteem level and the state self-esteem level. We suggested that, in order to study the dynamics of self-esteem that are intrinsically generated, an emergent-causality approach is necessary – which the SOSE model aims to make possible.

In Chapter 3, we tested the *temporal structure* of state self-esteem as a real-time process during parent-adolescent interactions. We adopted a qualitative phenomenological approach, whereby moment-to-moment emotional and behavioral indicators of adolescents’ state self-esteem are observed as they emerged during parent-child interactions, resulting in

state self-esteem time series. It was hypothesized that – in accordance with the SOSE model – state self-esteem would develop iteratively, giving way to structured variability that stems from the intrinsic dynamics of state self-esteem. Furthermore, we hypothesized that the intrinsic variability of state self-esteem across time would *not* resemble random temporal variability, as would be expected from the traditional perspective that each state self-experience is *intrinsically* independent from the previous, and where any causal dependence stems from an extrinsic dependence between environmental events.

To test this, we conducted Detrended Fluctuation Analyses (DFA) on the state self-esteem time series. We found that the time series exhibited a form of structured variability, called *pink noise*. This means that a series of measure shows long-range correlations (Wijnants, Hasselman, Cox, Bosman, & Van Orden, 2012). In this study, this means that state self-esteem at t_1 is not independent from state self-esteem at t_{1+n}. The mean DFA exponent differed significantly from that of randomized surrogate data ($p < 0.01$), which revealed uncorrelated random variability, called *white noise*. This finding showed that the temporal structure of state self-esteem variability exhibits long-range dependence and is not random. Additionally, a weak positive relationship was found between the DFA and context-independent autonomy levels. This chapter validated a central crux of the SOSE model, which was done by showing that state self-esteem develops iteratively, resulting in intrinsic dynamics at the state self-esteem level.

In Chapter 4, the real-time nature of trait self-esteem phenomenology during adolescence was tested. We posited that this phenomenology can be best conceptualized from the SOSE model, where trait self-esteem consists of trait self-esteem *attractor states* that repeatedly recur across real-time. We validated this conceptualization by testing whether trait self-esteem demonstrates two pivotal characteristics of attractor states. First, we showed that trait self-esteem attractor states fell into two profiles, relatively strong and relatively weak ($p < 0.01$), differentiated by their level of real-time constraint on state self-esteem variability in real-time. Second, we showed that the stronger trait self-esteem attractor states protected state self-esteem variability from real-time external perturbations (from the parent) more than weaker trait self-esteem attractor states ($p < 0.05$). In doing so, we validated the core propositions of the SOSE model regarding the nature of trait self-esteem and its dynamic relationship with state self-esteem.

In Chapter 5 we developed a theoretical conceptualization of the distinction between implicit and explicit self-esteem based on the SOSE model. Based on the SOSE-model propositions, we suggested that a qualitative distinction between implicit and explicit self-esteem is different at the trait level and the state level. At the state level, we suggested that each new iteration of state self-esteem has the potential to self-organize as explicit or implicit, depending on the lower-order network at each moment. State self-esteem is thus conceptualized as one continuous process of iterations, consisting of implicit and explicit moments. These moments thus occur at separate time points, but are part of the same process. Therefore, implicit and explicit self-esteem form one state self-esteem process, which changes in its quality (i.e. implicit or explicit) from moment-to-moment.

At the trait level, we suggested that implicit and explicit trait self-esteem can be conceptualized as separate trait self-esteem attractors, resulting from distinct pathways of long-term iterative development of state self-esteem. Individuals are thus expected to have implicit trait self-esteem attractors, as well as explicit trait self-esteem attractors.

We argued that the conceptualization suggested in this chapter can also integrate the two dominant (and competitive) perspectives of the implicit-explicit relationship, namely that implicit self-esteem and explicit self-esteem are one versus separate constructs. The proposed model suggests that at the state level, implicit and explicit self-esteem are one construct (i.e., one iterative process), and that at the trait level, implicit and explicit self-esteem are separate constructs (i.e., separate trait self-esteem attractor states). This chapter contributed to the understanding of the temporal nature of implicit and explicit self-esteem, and made a distinction between these processes at the trait level and at the state level.

3 Integration and Emerging Developments

This thesis provides unique information regarding the *intrinsic dynamics* of self-esteem, which is done by approaching self-esteem as a self-organizing construct that emerges out of lower-order interactions. Together, the chapters if this thesis show that *state* self-esteem exhibits intrinsic dynamics that result in long-range correlations across the real-time, and that the *trait* self-esteem constrains the degrees of freedom of state self-esteem by means of multiple attractor states. These results support the conceptualization held in this thesis that the intrinsic dynamics of self-esteem at the state level, at the trait level, and *between* the state and trait level, determine the real-time behavior of self-esteem. While an individual's self-esteem is of course in constant interaction with his or her environment, self-esteem is first and foremost a dynamic and complex construct that demonstrates its *own* intrinsic dynamic.

The above findings contradict the traditional approach to self-esteem and its state and trait constructs. While state self-esteem is commonly approached as passive contextually-based error (e.g., Kernis et al., 1993; Leary & Baumeister, 2000), this thesis shows that state self-esteem has its own intrinsic dynamics. Moreover, while trait self-esteem is commonly approached as a latent trait that generates real-time indicators (i.e. state self-esteem) in a unidirectional manner (e.g., Heatherton & Polivy, 1991), this thesis shows that trait self-esteem can potentially be multi-stable, and that the manifestation of trait self-esteem is a function of a bidirectional and continuously dynamic relationship with state self-esteem.

Finally, – and in response to my general question posed at the beginning of this thesis – the findings from this thesis help explain what the nature and origin of the underlying processes of self-esteem are. This thesis suggests that the nature of self-esteem is that of an emergent property. The time span across which this developmental emergence occurs determines the exact nature of the emergent property. As such, the nature of state self-esteem is that of an emergent property that is fleeting from moment-to-moment. The nature of trait self-esteem, on the other hand, is that of an emergent property that is self-maintaining across time. The trait self-esteem property is more specifically characterized by the equilibrium points, or attractor states, that the individual experiences through the recur-

ring pull that these points have on current and future iterations of state self-esteem; where the strength of this pull depends on the strength – i.e., width and depth – of the attractor states that make up the trait self-esteem attractor landscape.

Both of these emergent properties (i.e., trait and state self-esteem) originate from the self-experiential elements that occur in real-time (i.e. the present moment), and more specifically, the continuous interactions between these elements that result in the self-organizational process across the nested levels (from self-experiences, to state self-esteem, to trait self-esteem). From this perspective, the experience of self-esteem is the result of the intrinsic dynamics between the nested constructs of self-esteem. Given that this nested system is always dynamically evolving, so too is an individual's experience of self-esteem. While the historicity of self-maintained self-esteem provides individuals with experiential continuity, the nature of this continuity – as positive or negative, or as implicit or explicit – will continue to change in the future. Rather than being a direct cause of some external influence, these changes will come about through the moment-to-moment variability of how individuals experience themselves in the present moment. While individuals can of course reflect on their continuity of self-esteem – resulting in a view of themselves as positive or negative – this reflection is not the foundation of their experience of themselves as positive or negative. The foundation of the positivity or negativity of how individuals experience themselves, i.e., of self-esteem, consists of the processes and dynamics that give rise to the self-organization of emergent properties of self-esteem.

Aside from the theoretical advancements made in this thesis, the empirical studies in this thesis demonstrate that a methodological shift is necessary in order to study the intrinsic dynamics of the nested structure of self-esteem. This thesis shows that, alongside self-esteem questionnaires, it can also be advantageous to adopt new approaches to data, as well as new statistical analyses. Firstly, the observational methods used in this thesis demonstrate a novel way of approaching state self-esteem as an emotional-behavioral process of positive and negative self-experience in real-time. Secondly, the operationalization of trait self-esteem as a collection of idiosyncratic attractor states advances previous work (see, for example, Vallacher & Nowak, 2000) by capturing multiple idiosyncratic attractor states within individuals (rather than a fixed-point attractor), and doing so based on multivariate data (i.e. multiple forms of lower-order input, rather than one input that varies in valence). Thirdly, this thesis demonstrates the first attempt to analyze the concurrent dynamics of state self-esteem and trait self-esteem as separate processes. More generally, the methodological approach illustrates and emphasizes the advantageous of keeping 'time' intact in self-esteem data, and by analyzing the *within-individual* dynamics of self-esteem.

The current thesis is inductive by nature, where the general goal was primarily theory-oriented. As such, the theoretical formulations and empirical findings from this thesis pave the way for future studies that can incorporate the theoretical and methodological developments that emerged from this thesis.

4 Limitations

The observational nature of the data used in this thesis meant that transforming the filmed interactions between adolescents and their parents into multivariate and time-serial data was time intensive. As a result, the sample used for empirical studies was relatively small. Despite this, the empirical findings in this thesis were statistically significant, which made it possible to generalize from the data to the theoretical formulations made, thereby validating the *theory* developed in this thesis. However, whether the validated mechanisms from the proposed theory also apply to all adolescents outside of the current sample is unknown. It would therefore be useful to increase the sample size in order to generalize the current findings to the *general population*.

While the influence that parents had on their children's self-esteem was analyzed with regard to the *structural dynamics* involved, it was beyond the scope of the thesis to analyze the influence that parents had on their children's self-esteem with regard to *interaction content*. Additional research is necessary in order to shed light on the content-related influence that parents have on their children's self-esteem during interactions.

Finally, the new empirical approach utilized in this thesis necessitates more validation. The aim of the empirical studies in this thesis was to empirically validate the SOSE model, and not to empirically validate a new measurement of state and trait self-esteem. On the one hand, the data used in the current thesis was theory-grounded, which supports the construct validity of the approach. On the other hand, additional research is needed in order to systematically investigate the convergent and divergent validity of the approach utilized in this thesis.

5 Concluding Remarks

Altogether, the findings in this thesis support the Self-Organizing Self-Esteem model. As such, this thesis shows that self-esteem is likely more dynamic and more complex than researchers previously assumed[31]. Specifically, the chapters in this thesis show that these dynamics and complexity stem from the intrinsic dynamics of the nested structure of self-esteem; from the level of concrete self-experiences, to state self-esteem iterations, to the emergence of trait self-esteem attractors. In doing so, I hope to have shed light on the nature and origin of self-esteem as emergent properties of self-experience that are created by self-organizational processes across time.

[31] With the term "complex", I am referring to the complex dynamic systems approach to this term, where elements of a system interact, and where these interactions create emergent properties. The term complex should not be confused with the term "complicated", where a large amount of linear and deterministic associations between variables are included in one conceptual model.

References

Baumeister, R. F., Campbell, J. D., Krueger, J. I., & Vohs, K. D. (2003). Does high self-esteem cause better performance, interpersonal success, happiness, or healthier lifestyles? *Psychological Science in the Public Interest*, 4(1), 1–44. doi:10.1111/1529-1006.01431

Borsboom, D., Mellenbergh, G., & Van Heerden, J. (2003). The theoretical status of latent variables. *Psychological Review*, 110(2), 203–219. doi:10.1037/0033-295X.110.2.203

Coan, J. (2010). Emergent ghosts of the emotion machine. *Emotion Review*, 2(3), 274–285. doi:10.1177/1754073910361978

Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: attitudes, self-esteem, and stereotypes. Psychological Review, 102(1), 4–27.

Heatherton, T., & Polivy, J. (1991). Development and validation of a scale for measuring state self-esteem. *Journal of Personality and Social Psychology*, 60(6), 895–910. doi:10.1037//0022-3514.60.6.895

Kernis, M., Cornell, D., Sun, C., Berry, A., & Harlow, T. (1993). There's more to self-esteem than whether it is high or low: the importance of stability of self-esteem. *Personality Processes and Individual Differences*, 65(6), 1190–1204. doi:10.1037/0022-3514.65.6.1190

Leary, M. R., & Baumeister, R. F. (2000). The nature and function of self-esteem: Sociometer theory, Vol. 32. In M. P. Zanna (Ed.), Advances in experimental social psychology (pp. 1–62). San Diego, CA US: Academic Press.

Rosenberg, M. (1979). *Conceiving the Self*. Malabar, FL: Robert E. Krieger.

Schmittmann, V., Cramer, A., Waldorp, L., Epskamp, S., Kievit, R., & Borsboom, D. (2011). Deconstructing the construct: A network perspective on psychological phenomena. *New Ideas in Psychology*, 1–11. doi:10.1016/j.newideapsych.2011.02.007

Thelen, E., & Smith, L. B. (1994). *A Dynamic Systems Approach to the Development of Cognition and Action*. Cambridge, MA US: The MIT Press.

Vallacher, R. R., & Nowak, A. (2000). Landscapes of self-reflection: Mapping the peaks and valleys of personal assessment. In A. Tesser, B. R. Felson, & J. M. Suls (Eds.), *Psychological Perspectives on Self and Identity* (pp. 35–65). Washington, DC US: American Psychological Association.

Van Geert, P. (1994). *Dynamic Systems of Development: Change Between Complexity and Chaos*. Hertfordshire, England: Harvester Wheatsheaf.

Van Geert, P. (2014). Group versus individual data in a dynamic systems approach to development. *Enfance*, 3, 283–312.

Wijnants, M. L., Hasselman, F., Cox, R. F. A., Bosman, A. M. T., & Van Orden, G. (2012). An interaction-dominant perspective on reading fluency and dyslexia. *Annals of Dyslexia*, *62*(2), 100–19. doi:10.1007/s11881-012-0067-3

Zeigler-Hill, V. (2013). The importance of self-esteem. In V. Zeigler-Hill (Ed.), *Self-Esteem* (pp. 1–20). New York: Psychology Press.

Samenvatting

1 Onderzoeksmotivatie en Context

Self-esteem (eigenwaarde) wordt gezien als een zeer belangrijk concept in de hedendaagse psychologie (Zeigler-Hill, 2013). Het wordt vaak onderzocht als een voorspeller voor, of een uitkomst van, andere psychologische concepten – van academisch succes tot het hebben van plezierige relaties (Baumeister, Campbell, Krueger, & Vohs, 2003). In de meeste studies wordt self-esteem benaderd als een variabele, waarbij individuen een bepaalde score voor self-esteem hebben. In psychologisch onderzoek wordt self-esteem dus vaak gezien als iets dat onderscheid maakt tussen individuen of groepen: Persoon A heeft een hoog self-esteem, terwijl Persoon B een lager self-esteem heeft. Maar wat zit hier precies achter? Met andere woorden, hoe onstaat self-esteem, en wat zijn de eigenschappen van self-esteem? Dit proefschrift probeert deze vraag te beantwoorden.

Deze vraag wordt niet beantwoord door self-esteem te benaderen als iets dat gerepresenteerd kan worden door een score, en dat verklaard kan worden op basis van een aantal andere variabelen, wat de gangbare methode is (Van Geert, 2014). In plaats daarvan is de doelstelling van dit proefschrift om de onderliggende processen te ontrafelen die ten grondslag liggen aan het ontstaan van self-esteem, en waardoor self-esteem wordt gekenmerkt. In het traditionele onderzoek naar self-esteem wordt echter meer dan één 'self-esteem variabele' geconceptualiseerd. Self-esteem wordt gecategoriseerd als een *state* en een *trait* fenomeen (Kernis, Cornell, Sun, Berry, & Harlow, 1993), en als een expliciet en een impliciet fenomeen (Greenwald & Banaji, 1995). In dit proefschrift wordt de ervaring van deze vier constructen van self-esteem behandeld.

Om self-esteem te begrijpen op basis van de processen die ten grondslag liggen aan het ontstaan van self-esteem en self-esteem karakteriseren, wordt een complexe dynamische systemen benadering toegepast. Deze benadering bekijkt hoe de interactie tussen componenten verandert over de tijd en naar de manier waarop eigenschappen ontstaan (emergeren) in deze interactie (Thelen & Smith, 1994; Van Geert, 1994). In dit proefschrift wordt gesteld dat self-esteem een emergente eigenschap is, en dat self-esteem drie aparte, maar ook verstrengelde, subniveaus bevat, namelijk het micro-, meso- en macroniveau. Deze niveaus worden gekenmerkt door de verschillende tijdsschalen waarin zij worden gevormd.

In dit proefschrift wordt gesteld dat het meest basale niveau van self-esteem het microniveau is. Dit betreft de positieve en negatieve emotionele- en gedragservaringen die mensen hebben ten opzichte van zichzelf. Vervolgens wordt op meso niveau het state self-esteem gevormd. Tenslotte emergeert trait self-esteem op macroniveau. In dit proefschrift wordt gesteld dat de drie niveaus een bidirectionele relatie met elkaar hebben. Verder wordt gesteld dat deze bidirectionele relatie ten grondslag ligt aan de zelforganisatie van self-esteem, waardoor elk niveau van self-esteem temporeel dynamisch is, en waardoor self-esteem ook zichzelf in stand houdt.

Deze beweringen worden in dit proefschrift uitgelegd, en ze vormen de basis van een theoretisch model, het Self-Organizing Self-Esteem (SOSE) model. Dit model heeft als

kernpunt de dynamiek binnen en tussen de drie niveaus van het gehele self-esteem-systeem. Op basis van dit model worden voorspellingen over de dynamische aarde van state en trait self-esteem binnen een adolescente populatie (N = 13, gemiddelde leeftijd = 13.6) getoetst. Tenslotte wordt, op basis van de beweringen die gemaakt worden in het SOSE model, een klassiek onderscheid van self-esteem fenomenen geëxploreerd: het onderscheid tussen impliciet en expliciet self-esteem.

2 Samenvatting van Bevindingen

In Hoofdstuk 2 wordt het Self-Organizing Self-Esteem (SOSE) model gepresenteerd en verder uitgelegd. Wij laten zien hoe het SOSE model in tegenstelling staat tot de traditionele benadering van self-esteem, waarin state en trait self-esteem als delen van één construct worden gezien, en waarbij state self-esteem geconceptualiseerd wordt als de ruis vanuit de context rond latente trait self-esteem. In tegenstelling daarmee stelt het SOSE model dat trait self-esteem en state self-esteem afzonderlijke constructen zijn op twee onderling verbonden tijdsschalen. Het model schetst hoe de aard van beide constructen, en ook de relatie ertussen, geconceptualiseerd kunnen worden op basis van een primaire bottom-up proces, waarbij trait self-esteem een emergent macroniveau-product is van state self-esteem dynamiek, en waarbij state self-esteem ontstaat op meso niveau als product van microniveauervaringen van het zelf op dat moment. Het model beschrijft ook een tweede proces, namelijk *top-down constraint*, waar het ontstaan van een hogere-order construct resulteert in een beperking van de mogelijkheden van lagere-order interacties. Samen vormen deze processen een zelf-organiserend systeem.

In dit hoofdstuk beschrijven wij hoe het SOSE-model overeenkomt met een *emergent-causality* benadering(Coan, 2010; Schmittmann et al., 2011), dat stelt dat een hoger-order construct ontstaat uit de interacties tussen lagere-order componenten. Wij laten zien dat deze benadering niet gangbaar is in psychologisch onderzoek. In plaats daarvan wordt meestal een *'generative-causality' benadering* gebruikt, zij het impliciet. In deze benadering wordt het bestudeerde fenomeen gezien als een latente trait die ervaringen en acties veroorzaakt (Borsboom et al., 2003; Coan, 2010).

Wij lieten zien dat een generative-causality benadering in de meeste self-esteem-onderzoeken wordt gebruikt in óf de theoretische óf de empirische aanpak van de relatie tussen trait en state self-esteem. Het gebruik van een generative-causality benadering in de theoretische aanpak is te zien in de gebruikelijke *baseline* en *barometer* benadering van self-esteem (Rosenberg, 1979), en in de empirische aanpak is het te zien in de tendens om uit te gaan van het gemiddelde van herhaalde metingen van state self-esteem om iets te kunnen zeggen over de algemene kenmerken (bijvoorbeeld, gemiddelde en standaard deviatie) van trait self-esteem (bijvoorbeeld, Kernis, 1993). Op basis van de intrinsieke principes van een generative-causality benadering - en geïllustreerd door de gangbare studies - stellen wij dat een generative-causality benadering inherent minder geschikt is om de intrinsieke dynamiek van self-esteem te bestuderen. Wij stellen dat een emergent-causality benadering nodig is om de dynamiek van self-esteem te bestuderen die intrinsiek gegenereerd is. Het SOSE model probeert dit mogelijk te maken.

In Hoofdstuk 3 hebben we de temporele structuur van state self-esteem getoetst als een real-time proces dat plaatsvindt tijdens ouder-kind interacties. Wij hebben een kwalitatieve en fenomenologische benadering gekozen, waarbij momentane emotionele- en gedragsmatige indicatoren van state self-esteem van adolescenten geobserveerd werden in ouder-kind interacties. Dit resulteerde in tijdseries van state self-esteem. Verondersteld werd dat – in overeenkomst met het SOSE model – state self-esteem zich ontwikkelt als een iteratief proces, en resulteert in gestructureerde variabiliteit die voortkomt uit de intrinsieke dynamiek van state self-esteem. Verder veronderstelden we dat de intrinsieke variabiliteit van state self-esteem over tijd *geen* willekeurige temporele variabiliteit zou vertonen. Dit zou te verwachten zijn geweest vanuit de traditionele benadering dat elke state self-esteem intrinsiek onafhankelijk is van de vorige, en waarbij eventuele causale afhankelijkheid voortkomt uit extrinsieke afhankelijkheid tussen contextuele gebeurtenissen.

Om dit te toetsen, hebben we *Detrended Fluctuation Analyses* (DFA) gedaan op de tijdseries van state self-esteem, en we vonden dat de tijdseries gestructureerde variabiliteit vertoonden, genaamd *pink noise.* Dit betekent dat een serie metingen lange-termijn afhankelijk is (Wijnants, Hasselman, Cox, Bosman, & Van Orden, 2012). In deze studie zou dat bijvoorbeeld betekenen dat state self-esteem op t_1 niet onafhankelijk is van state self-esteem op t_{1+n}. De gemiddelde DFA exponent was significant anders dan de DFA van gerandomiseerd gesimuleerde data ($p < 0.01$). Deze bevinding laat zien dat de temporele structuur van state self-esteem-variabiliteit lange-termijn afhankelijkheid vertoont en dus niet willekeurig is. Verder hebben we een zwakke positieve relatie gevonden tussen de DFA en context-onafhankelijke autonomieniveaus. In dit hoofdstuk hebben we een belangrijke eigenschap van het SOSE model gevalideerd door te laten zien dat state self-esteem zich iteratief ontwikkelt, en dat dat leidt tot intrinsieke dynamiek op het niveau van state self-esteem.

In Hoofdstuk 4 zijn de real-time kenmerken van trait self-esteem getoetst tijdens ouder-kind interacties. Wij stellen dat deze fenomenologie het beste kan worden geconceptualiseerd vanuit het SOSE model, waarin trait self-esteem bestaat uit attractoren die verschillende keren terugkomen over tijd. Wij hebben deze conceptualisatie gevalideerd door te toetsen of trait self-esteem twee belangrijke eigenschappen van attractoren vertoont. Eerst hebben we aangetoond dat de trait self-esteem-attractoren kunnen worden onderscheiden in twee soorten: sterke en zwakke attractoren ($p < 0.01$). We maakten dit onderscheid op basis van de mate waarin de attractor de state self-esteem-variabiliteit in real-time beperkte. Vervolgens hebben wij aangetoond dat, vergeleken met de zwakkere attractoren, de sterkere trait self-esteem-attractoren samen hingen met geringere variabiliteit van state self-esteem bij externe verstoringen (van de ouder) ($p < 0.05$). Hierdoor hebben we één van de kernprincipes van het SOSE model kunnen valideren, namelijk de aard van trait self-esteem als attractoren die op dynamische wijze in wisselwerking staan met state self-esteem.

In Hoofdstuk 5 presenteren we een theoretische conceptualisatie van het onderscheid tussen impliciet en expliciet self-esteem, gebaseerd op het SOSE model. Op

basis van de stellingen in het SOSE model stellen we dat het kwalitatieve onderscheid tussen impliciet en expliciet self-esteem anders is op het trait niveau dan op het state niveau. Op het state niveau stellen wij dat elke nieuwe iteratie van state self-esteem de potentie heeft om te zelforganiseren als expliciet of als impliciet. State self-esteem is dus geconceptualiseerd als een continue proces van iteraties met impliciete en expliciete momenten. Deze vinden dus plaats op verschillende momenten, maar zijn deel van hetzelfde proces. Momenten van impliciet en expliciet self-esteem vormen dus één state self-esteem-proces, en dat proces verandert met betrekking tot de kwaliteit (dat wil zeggen, impliciet of expliciet) van een moment naar de volgende moment.

Op het trait niveau stelden wij dat impliciet en expliciet trait self-esteem geconceptualiseerd kunnen worden als aparte attractoren, die voortkomen uit aparte trajecten van de langetermijn-ontwikkeling van state self-esteem. Er wordt dus gesteld dat individuen zowel impliciet trait self-esteem-attractoren als expliciet trait self-esteem-attractoren hebben.

Wij betogen dat de conceptualisatie zoals in dit hoofdstuk beschreven wordt ook de twee dominante (en tegenovergestelde) perspectieven van de relatie tussen impliciet- en expliciet self-esteem kan integreren. Deze twee perspectieven zijn dat impliciet self-esteem en expliciet self-esteem één dan wel twee constructen zijn. Het gestelde model betoogt dat, op het state niveau, impliciet en expliciet self-esteem één construct zijn (één iteratief proces), en dat, op het trait niveau, impliciet en expliciet self-esteem aparte constructen zijn (aparte trait self-esteem-attractoren). Dit hoofdstuk draagt bij aan inzichten over de temporele eigenschappen van impliciet en expliciet self-esteem, en aan inzichten in hoe deze eigenschappen onderscheiden kan worden op het state- en op het trait-niveau.

3 Integratie en Nieuwe Ontwikkelingen

Dit proefschrift levert unieke informatie op ten opzichte van de *intrinsieke dynamiek* van self-esteem. Dit wordt gedaan door self-esteem te benaderen als een zelf-organiserend construct dat ontstaat uit lagere-orde interacties. Samen tonen de hoofdstukken van dit proefschrift aan dat *state self-esteem* intrinsieke dynamiek laat zien. Dit heeft tot gevolg dat metingen van state self-esteem lange-termijn afhankelijk zijn, en dat *trait self-esteem* de vrijheidsgraden van state self-esteem kan beperken. Deze bevindingen steunen de conceptualisatie dat de intrinsieke dynamiek van self-esteem op het state niveau, op het trait niveau, en tussen het state en trait niveau, het real-time gedrag van self-esteem (als geheel) veroorzaakt. Terwijl het self-esteem van een individu natuurlijk altijd in interactie is met zijn of haar omgeving, is self-esteem in de eerste plaats een dynamische en complexe construct dat zijn eigen intrinsieke dynamiek heeft.

De bovenstaande bevindingen zijn in tegenspraak met de gangbare benadering van self-esteem, met name van state- en trait self-esteem. Terwijl state self-esteem vaak benaderd wordt als passieve ruis vanuit de context (e.g., Kernis et al., 1993; Leary & Baumeister, 2000), laat dit proefschrift zien dat state self-esteem een eigen intrinsieke dynamiek heeft. Terwijl trait self-esteem vaak benaderd wordt als een latente variabele dat de real-time indicatoren (dat wil zeggen, state self-esteem) genereert op een unidirectionele

manier (e.g., Heatherton & Polivy, 1991), laat dit proefschrift zien dat trait self-esteem multi-stabiel is, en dat de manifestatie van trait self-esteem een functie is van een bi-directionele en doorgaande dynamiek met state self-esteem.

Ten slotte, - en als reactie op de algemene vraag die gesteld wordt in dit proefschrift - kunnen de bevindingen van dit proefschrift het onstaan van en de eigenschappen van de onderliggende processen van self-esteem verklaren. Dit proefschrift stelt dat de self-esteem gekarakteriseerd kan worden als een emergente eigenschap. De tijdspanne waarbinnen deze ontwikkelingsemergentie plaatsvindt bepaalt de precieze aard van de emergente eigenschap. Daaruit volgt dat de state self-esteem gekarakteriseerd kan worden als een emergente eigenschap die vluchtig is van moment-tot-moment. Trait self-esteem wordt echter gekarakteriseerd als een emergente eigenschap die stabiel is over de tijd. De trait self-esteem kan worden gekarakteriseerd als de herhaling die een individu ervaart, omdat state-self esteem herhaaldelijk naar dit punt terugkeert. De sterkte van deze aantrekkingskracht is afhankelijk van de sterkte (dat wil zeggen, de breedte en diepte) van de attractoren in het trait self-esteem landschap.

Beide emergente eigenschappen (trait- en state self-esteem) komen voort uit elementen van ervaringen van het zelf die plaatsvinden in het hier-en-nu (emoties, cognities, acties), en meer specifiek uit de voortdurende interacties tussen deze elementen, en het proces van zelforganisatie van alle verzamelde niveaus (van ervaringen van het zelf, tot state self-esteem, tot trait self-esteem). De ervaring van self-esteem ligt daarmee ten grondslag aan de intrinsieke dynamiek tussen de verschillende aspecten van self-esteem. Gegeven het idee dat dit systeem zich voortdurend ontwikkelt, kan de ervaring van een individu van zichzelf zich ook voortdurend ontwikkelen. Terwijl de herhaling van self-esteem een zeker niveau van experientiele continuïteit kan bieden, verandert de aard van deze continuïteit - positief of negatief, impliciet of expliciet - voortdurend. Deze veranderingen worden niet direct veroorzaakt door externe factoren, maar door de real-time variabiliteit in de manier waarop een individu zich zelf in het hier-en-nu ervaart. Terwijl individuen natuurlijk kunnen reflecteren op hun herhaling van zelf-ervaring - wat leidt tot een positief of negatief beeld van zichzelf - is dit beeld zelf niet het fundament van hun positieve of negatieve ervaringen van zichzelf. Het fundament van de postieve of negatieve ervaringen van zichzelf bestaat uit de zelforganiserende en emergente dynamiek van de verzamelde niveaus van self-esteem.

Behalve de theoretische ontwikkelingen die beschreven worden in dit proefschrift, laten de empirische studies in dit proefschrift ook zien dat een methodologische verandering nodig is om de intrinsieke dynamiek van de verzamelde structuur van self-esteem te kunnen bestuderen. Dit proefschrift laat zien dat, naast het gebruik van vragenlijsten, het ook goed kan zijn om nieuwe vormen van dataverzameling en nieuwe statistische analyses te ontwikkelen. Ten eerste vormt de observationele methode die gebruikt wordt in dit proefschrift een nieuwe benadering van state self-esteem, namelijk als positieve en negatieve emotionele- en gedragsprocessen die plaatsvinden in real-time. Ten tweede bouwt de operationalisatie van trait self-esteem, als een collectie van

idiosyncratische attractoren, voort op voorgaand empirisch werk (bijvoorbeeld, Vallacher & Nowak, 2000). In deze aanpak worden meerdere idiosyncratische attractoren gemeten binnen individuen (in plaats van één fixed-point attractor), en er wordt gebruik gemaakt van multivariate data (dat wil zeggen, meerdere vormen van lagere orde input in plaats van één variabele die positief of negatief is). Ten derde beschrijft dit proefschrift de eerste poging om de gelijktijdige dynamiek van zowel state- als trait self-esteem als aparte processen te analyseren. In de brede zin illustreert de methodologische aanpak van dit proefschrift dat het gunstig kan zijn om 'tijd' intact te houden voor self-esteem-data, en om de intra-individuele dynamiek van self-esteem te analyseren.

Dit proefschrift is inductief van aard, waardoor het algemene doel primair theorie-georiënteerd was. Zo hebben de theoretische formuleringen en empirische bevindingen van dit proefschrift de weg bereid voor toekomstige studies die op de theoretische en methodologische ontwikkelingen in dit proefschrift willen voortbouwen.

4 Beperkingen

De observationele data die gebruikt werd voor dit proefschrift leidden ertoe dat het vertalen van deze gefilmde interacties naar multivariate en tijdseriële data een tijds-intensief proces was. Hierdoor was de steekproef die gebruikt werd voor de empirische studies relatief klein. Ondanks de kleine steekproef zijn de empirische bevindingen in dit proefschrift statistisch significant, waardoor het mogelijk is om te generaliseren van de data naar de theoretische formuleringen, waardoor de *theorie* die in dit proefschrift is ontwikkeld gevalideerd kon worden. Echter, het blijft onbekend of de bevindingen gegeneraliseerd kunnen worden naar alle adolescenten buiten onze steekproef. Daarom zou het nuttig zijn om de steekproef te vergroten om de bevindingen van dit proefschrift te kunnen generaliseren naar de *algemene populatie*.

Terwijl de invloed van de ouders op de adolescenten werd geanalyseerd wat betreft de structurele dynamiek, viel de invloed van de ouders op de adolescenten wat betreft de *inhoud* van de interacties buiten de scope van dit proefschrift. Verder onderzoek is nodig om inzicht te geven in de inhoudelijke invloed die ouders hebben op de self-esteem van hun kinderen tijdens interacties.

Ten slotte vereisen de nieuwe empirische benaderingen van self-esteem die ontwikkeld werden in dit proefschrift meer validatie. Het doel van de empirische studies binnen dit proefschrift was om het SOSE-model te valideren, en niet om de nieuwe metingen van state- en trait self-esteem te valideren. Er is dus meer onderzoek nodig om de convergente en divergente validiteit van deze benadering te valideren.

5 Concluderende opmerkingen

Samengevat steunen de bevindingen van dit proefschrift het Self-Organizing Self-Esteem model. Dit proefschrift laat daarmee zien dat self-esteem meer dynamisch en meer complex is dan onderzoekers vaak denken[32]. De hoofdstukken in dit proefschrift laten zien

[32]Met de term "complex" refereer ik naar de complex dynamische systemen benadering van deze term, waarbij componenten van een systeem in wisselwerking gaan,

dat deze dynamiek en complexiteit voortkomen uit de intrinsieke dynamiek van de gehele structuur van self-esteem; van het niveau van ervaringen van het zelf, via iteraties van state self-esteem, tot het ontstaan van trait self-esteem-attractoren. Hierdoor hoop ik inzicht te hebben gegeven in de eigenschappen en het ontstaan van self-esteem als emergente eigenschap van ervaringen van het zelf die gecreëerd wordt door zelf-organiserende processen over tijd.

en waarbij deze wisselwerking tot emergente eigenschappen leidt. De term "complex" moet niet worden verward met "gecompliceerd", waarbij een groot aantal lineaire en deterministische associaties tussen variabelen opgenomen wordt in één conceptueel model.

Referenties

Baumeister, R. F., Campbell, J. D., Krueger, J. I., & Vohs, K. D. (2003). Does high self-esteem cause better performance, interpersonal success, happiness, or healthier lifestyles? *Psychological Science in the Public Interest*, 4(1), 1–44. doi:10.1111/1529-1006.01431

Borsboom, D., Mellenbergh, G., & Van Heerden, J. (2003). The theoretical status of latent variables. *Psychological Review*, 110(2), 203–219. doi:10.1037/0033-295X.110.2.203

Coan, J. (2010). Emergent ghosts of the emotion machine. *Emotion Review*, 2(3), 274–285. doi:10.1177/1754073910361978

Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: attitudes, self-esteem, and stereotypes. Psychological Review, 102(1), 4–27.

Heatherton, T., & Polivy, J. (1991). Development and validation of a scale for measuring state self-esteem. *Journal of Personality and Social Psychology*, 60(6), 895–910. doi:10.1037//0022-3514.60.6.895

Kernis, M., Cornell, D., Sun, C., Berry, A., & Harlow, T. (1993). There's more to self-esteem than whether it is high or low: the importance of stability of self-esteem. *Personality Processes and Individual Differences*, 65(6), 1190–1204. doi:10.1037/0022-3514.65.6.1190

Leary, M. R., & Baumeister, R. F. (2000). The nature and function of self-esteem: Sociometer theory, Vol. 32. In M. P. Zanna (Ed.), Advances in experimental social psychology (pp. 1–62). San Diego, CA US: Academic Press.

Rosenberg, M. (1979). *Conceiving the Self*. Malabar, FL: Robert E. Krieger.

Schmittmann, V., Cramer, A., Waldorp, L., Epskamp, S., Kievit, R., & Borsboom, D. (2011). Deconstructing the construct: A network perspective on psychological phenomena. *New Ideas in Psychology*, 1–11. doi:10.1016/j.newideapsych.2011.02.007

Thelen, E., & Smith, L. B. (1994). *A Dynamic Systems Approach to the Development of Cognition and Action*. Cambridge, MA US: The MIT Press.

Vallacher, R. R., & Nowak, A. (2000). Landscapes of self-reflection: Mapping the peaks and valleys of personal assessment. In A. Tesser, B. R. Felson, & J. M. Suls (Eds.), *Psychological Perspectives on Self and Identity* (pp. 35–65). Washington, DC US: American Psychological Association.

Van Geert, P. (1994). *Dynamic Systems of Development: Change Between Complexity and Chaos*. Hertfordshire, England: Harvester Wheatsheaf.

Van Geert, P. (2014). Group versus individual data in a dynamic systems approach to development. *Enfance*, 3, 283–312.

Wijnants, M. L., Hasselman, F., Cox, R. F. A., Bosman, A. M. T., & Van Orden, G. (2012). An interaction-dominant perspective on reading fluency and dyslexia. *Annals of Dyslexia*, *62*(2), 100–19. doi:10.1007/s11881-012-0067-3

Zeigler-Hill, V. (2013). The importance of self-esteem. In V. Zeigler-Hill (Ed.), *Self-Esteem* (pp. 1–20). New York: Psychology Press.

About the author

Naomi de Ruiter was born in Canada (1986) and moved to the Netherlands in 2002, where she finished the International Baccalaureate program at the International School in Haren. In 2005 she began studying Psychology at the University of Groningen, majoring in clinical psychology. In 2010 she graduated cum laude in the Research Master Behavioral and Social Sciences, in which she followed the education and developmental psychology program. Immediately afterwards, she started her PhD in the developmental processes research group at the University of Groningen, funded by a doctoral fellowship awarded by the Faculty of Behavioral and Social Sciences. During her PhD, she organized and chaired two symposia abroad on the theoretical and methodological applications of complex dynamic systems principles to developmental psychology. She presented her research at many national conferences as well as international conferences in Turkey, USA (Texas and Florida), Switzerland, Greece, and Italy. In her final years of her PhD she travelled to Florida Atlantic University (USA) and Queen's University (Canada) for two-week and two-month research visits, respectively. She received three travel grants to fund her research visits and presentations, from the Jacobs Foundation, Nicolaas Mulerius Foundation, and the Stichting Groninger Universiteitsfonds. Since 2010 Naomi has supervised bachelor and master students and taught several seminar courses in the Psychology Bachelor program. Since 2012 she has coordinated and taught the undergraduate course Developmental Psychology in the English-language Psychology Bachelor program. Naomi currently works as a researcher and lecturer at the University of Groningen, where she is applying the complex dynamic systems perspective to new areas of child and adult development in the domain of academics and performance arts, both in the context of dyadic interaction. Alongside her academic activities, she is an actor in the improvisational-comedy organization *Stranger Things Have Happened*, performing weekly and monthly improvised shows. She also teaches improvisational comedy at the student cultural center in Groningen (USVA) and trains an improvisational-comedy student team.

Acknowledgements

Doing a PhD isn't normally referred to as a walk in the park. However, I can honestly say that these past four years have been some of the most enjoyable and stimulating years of my life. This wouldn't be the case if it weren't for so many special people, whom I would like to acknowledge here.

First, I would like to thank my (co-)promoters, Prof. Paul van Geert and Dr. Saskia Kunnen. Paul, you've been a source of inspiration throughout the various stages of my academic trajectory. You sparked my initial interest in the complex dynamic systems perspective, and have continued to inspire ever since. Your creative approach to science, your talent as an artist, and your jovial character are remarkable to say the least. I feel honored to have had you as my promoter and mentor. Thank you for teaching me how to approach research creatively, for giving me so many opportunities to develop as a researcher and lecturer, and for giving me the room to find my own questions and answers. Saskia, you were (and are) such a source of support throughout my entire PhD trajectory. You were always there to help me brainstorm about practical issues, from designing my study and coding scheme to simple advice on a personal level. Thank you for helping me find and follow my academic interests, and for being such an enthusiastic and warm-hearted supervisor. Paul and Saskia, you have shaped my idea of what a researcher should be and taught me to approach each new step in the research process with curiosity and open-mindedness.

I'm very grateful to my assessment committee. Prof. Robin Vallacher, Prof. Isabel Granic, and Prof. Douwe Draaisma, thank you for putting the time and effort into reading my work and casting a critical eye. Robin, thank you for opening up your home to my colleagues and me for the two weeks that we stayed with you in Boca Raton and for your helpful, critical feedback. Isabel, I've enjoyed our talks at the multiple conferences that we've both attended, and appreciate your encouragement. Robin and Isabel, you have both set examples of how to successfully apply complex dynamic systems principles to social and developmental psychology, respectively, and I have always enjoyed and been inspired by your work.

My colleagues from the developmental psychology department, thank you for being such a supportive and talented group of researchers. I've very much enjoyed working with you, and I'm looking forward to continuing to do so. Thank you for your ideas and critical questions during research meetings, and for numerous discussions about research, teaching, and finding a suitable work-life balance. Some of the highlights of these past years were during national and international conferences that I attended with some of you. These trips were always both fun and intellectually stimulating. Mandy, Wieke, Ruud, Steffie (and Gloria – my colleague from abroad), you made the trips to Greece, Turkey, and America both hilarious (in retrospect!) and productive – what more could you ask for? Dankjulliewel!

Some colleagues deserve special mention of course. My office mates for the past years, Mandy and Marlenny, thank you for all of the practical, intellectual, and – above all

– emotional support. Sharing laughter, tears, and moments of craziness in our overly green room has been such a privilege. Steffie, you've been a part of my whole academic trajectory in the most varied and constant way, from my student assistant job, to co-teaching Developmental Psychology for two years; you've always been so supportive and helpful, and I'm very grateful for that. Finally, to my colleagues who were also co-authors, Paul, Saskia, Steffie, Ruud, and Ralf, thank you for your critical thoughts and collaboration.

Dr. Tom Hollenstein, my time in Kingston was a great privilege. I loved being a part of your Adolescent Dynamics Lab. Thank you for all of the stimulating conversations, for your mentoring, for your critical comments on (various) manuscripts, and for collaborating with me. I very much hope we will find another reason to collaborate in the future.

Colleagues from other departments of the RuG – clinical and social psychology as well as pedagogy, thank you for your kindness and your support. I loved being able to catch up or vent frustrations when bumping into each other in the faculty kitchen or in the hallway.

Moving away now from the academic circles, Joyce and Rob, my mother and stepfather, thank you for supporting me throughout my studies and my PhD, and for listening to my insecurities and anxieties.

I know this is going back a while, but it was at the International School in Haren that my interest in learning was ignited, and where my potential as a student started to develop. The transition from high school in Canada to the International School was pivotal in setting the path that eventually led to me doing a PhD. Mike Weston, thank you for helping me recruit participants from the school for my research. I owe special thanks to Allan Wilcox. Allan, your English and Theory of Knowledge lessons were always highly analytical. It was during your classes that I realized that I love writing and working through intellectual problems – interests that have helped me throughout my PhD.

Helen and Allan, my parents-in-law, thank you both for your continued support throughout my studies and my PhD. Helen, you've been a great source of inspiration as a highly respected female academic. I still do not know how you manage to be so academically successful without compromising on your multiple creative talents and your warm and caring disposition. You've set a very high standard for living a full and rounded life, which is both daunting and inspiring. Thank you as well for all of your comforting advice regarding teaching, writing (and defending) my PhD, and proofreading application letters.

All of my friends in Groningen, thank you for keeping my life balanced and for your love and support. While there are too many people to thank individually, I would like to acknowledge the following people especially:

Fellow members of Stranger Things Have Happened (old and present members), you have been a source of, and outlet for, creativity. My time with you during rehearsals and performances, touring and just socializing has kept me from being swallowed up in academic life and stress. Doing improv comedy with you has taught me how to give in to the unknown, to let go of the need to always plan, and it has allowed me to get used to

stepping outside of my comfort zone. Thank you for the past 6 years of weekly enjoyment and laughter.

Johanna, my fellow psychology student and close friend, thank you for all of your support in absolutely every part of my life.

Jeroen, Elger, and Kees, thank you for training me as an actor - Jeroen and Elger as directors of my favorite theater plays, Kees as our trainer of improv comedy.

Finally, I owe the most to Tom – my husband and best friend. Thank you for believing in me throughout our years together. I wouldn't be where I am now if it wasn't for you. You kept me going when I thought I couldn't or lacked the motivation, you pushed me when I needed to be pushed, and you convinced me of my talents when I needed convincing; for that I am very grateful. Thank you for being unfailingly patient with me coming home from work too late, and with my moments of anxious rumination about my PhD and academic life. Thank you for being a soundboard when I was working through theoretical puzzles, for proofreading endless applications, grant proposals, articles, and Dutch e-mails before I could properly speak Dutch. I am grateful to have you in my life as my improv buddy, my travel companion, and my partner in life. Thank you for inspiring me, and for filling my life with love and adventure.

To all of you, and to many more people who I didn't specifically mention here, I feel very grateful for your friendship and your support.

Thank you, dankjewel!

Naomi de Ruiter
April 26, 2015