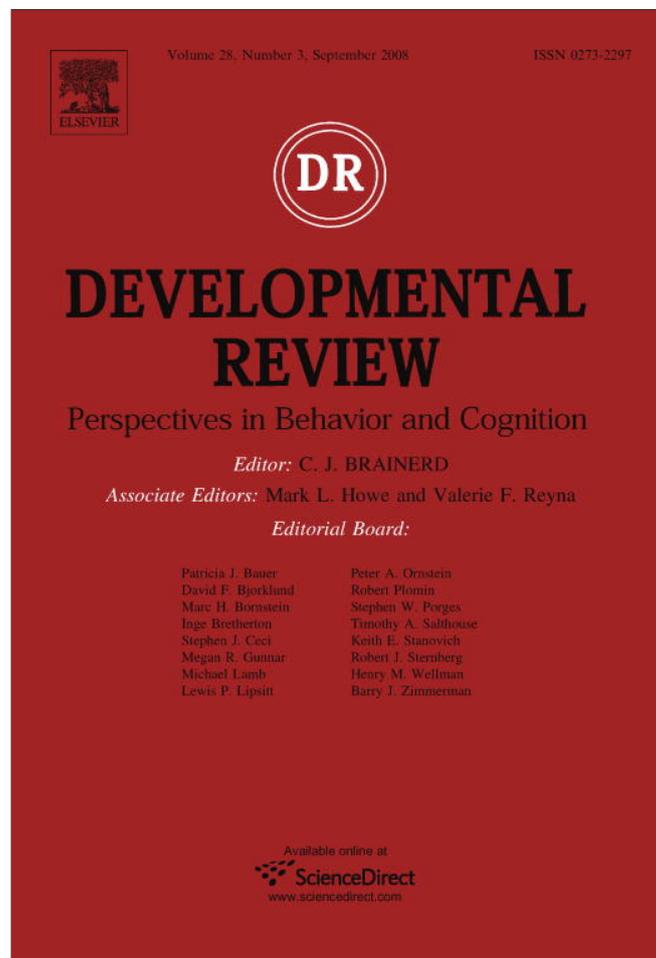


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Time and identity: A framework for research and theory formation

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ABSTRACT

This article presents a conceptual framework for the study of identity in the context of developmental and real-time. The framework consists of two dimensions related to the notion of time. One dimension involves the distinction between short- and long-term processes, or, as we call them, the micro- and macro-perspective on time. The second dimension focuses on the way time features in the explanation of change and development and concerns the distinction between static and dynamic approaches. Applying the framework to the existing literature on identity reveals empty slots in the descriptive space. Suggestions are given to fill one particular quadrant, the micro-dynamic field. Finally, we introduce dynamic systems theory as an integrative perspective on identity development. Dynamic systems theory serves as a basis to develop a theory of identity that does justice to the assumption that identity development is taking place on several interconnected time scales.

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The aim of this article is to present a framework for the study of identity in the context of time, ranging from the time of human actions to the time of (life-span) development. The framework should allow us to compare existing theories and approaches and eventually spot and specify empty slots and lacunae, which will lead to suggestions for further research questions and methods.

In order to arrive at this goal, we will first provide a working definition of identity. Secondly, we will outline a framework for dealing with time in the context of developmental research. The framework consists of two dimensions or, more precisely, categorical distinctions. One involves the distinction between time scales, i.e. characteristic lengths of intervals at which phenomena are studied and

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will focus on the distinction between short- and long-term processes, or, as we call them, the micro- and macro-perspective on time. The second focuses on the way time features in the explanation of change and development and concerns the distinction between static and dynamic approaches. Thirdly, we will apply this framework to the existing literature on identity and specify which place the existing literature occupies in the two-dimensional space. We will identify empty slots in the descriptive space and in particular focus on one particular quadrant, the micro-dynamic field. We will then proceed by specifying which research should be done to fill it in and what its contribution can be to the existing research. Finally, we introduce dynamic systems theory as an integrative perspective on identity development. Dynamic systems theory allows us to combine and integrate knowledge from various sources and different approaches and it serves as a basis to develop a theory of identity that does justice to the assumption that identity development is taking place on several interconnected time scales. The article closes with a proposal for an explicit dynamic systems model for the development of autonomy and connectedness. On the basis of that model, we show how the quadrants of the framework relate to each other and point out future directions for research.

A framework for identity

The aim of this section is to provide a practical working definition of identity. The sort of description we shall provide is in the spirit of the species descriptions one finds in a bird watchers book, namely a number of properties by means of which the observer can recognize, say, a Eurasian jay, when he sees one in the wild (or identity, in a study that deals with it). Thus, we will try to identify typical and common features and not aim at providing an exhaustive definition.

Erik Erikson—What is identity?

Grasping the phenomenon of identity and formulating a satisfying definition causes serious difficulties (see for instance Oppenheimer's complaint in Graafsma, Bosma, Grotevant, & De Leviata, 1994). The issue of vagueness and the difficulties around defining identity are still standing. Vagueness and fuzziness, however, might be important inherent qualities of the concept of identity itself. Consequently, one of the biggest challenges within the field is to find a way how to study identity that does justice to its inherent qualities. As suggested by Kroger (2004), Erik Erikson, whose work inspired developmental psychology and the field of adolescent identity development in particular, acknowledged the multidimensionality and versatility of the concept:

“At times, identity refers to a structure or a configuration, at other points it refers to a process. Still on other occasions identity is viewed as both a conscious subjective experience as well as an unconscious entity” (in Kroger, 2004, p. 34).

This statement makes clear that Erikson viewed identity as something which can be conceived of both as a configuration and as a process (see also Breakwell, 1988) and which entails conscious as well as unconscious elements. The process of identity formation “. . . is luckily and necessarily, for the most part unconscious except where inner conditions and outer circumstances combine to aggravate a painful, or elated, ‘identity-consciousness’” (Erikson, 1968, p. 22). In contrast to this broad and open view Erikson also gave a quite specific and workable definition of identity:

“The conscious feeling of having a personal identity is based on two simultaneous observations: the perception of the selfsameness and continuity of one's one existence in time and space and the perception of the fact that others recognize one's sameness and continuity” (Erikson, 1968, p. 50).

This definition allows us to specify two crucial elements of identity. First of all, there is sameness and continuity within the process of change. The feeling of knowing who one is, is challenged by the discovery that “. . . such self-certainty ever again falls prey to the discontinuities of development itself” (Erikson, 1968, p. 160; see also the metaphor of the changes of a fruit tree in the course of the seasons in Grotevant, Bosma, De Levita, & Graafsma, 1994). The change and sameness dimension points to the notion of variance and invariance. Identity is defined as the invariant set over a series of transforma-

tions. Sameness is whatever remains the same given the transformations that have taken place in the past. At the same time sameness also has a future orientation: one wants to become somebody or something in the future, choose a certain job and so on, while at the same time one remains the same person. Thus, despite future changes one seeks continuity and sameness in one's life. Particularly the period of adolescence is a period of changes, discontinuities and transformations. Changes occur within the adolescent, like maturation processes, involving biological and hormonal changes. In addition there are also transformations within one's environment, and in how the environment reacts to the adolescent, e.g. changing social contexts and relationships, changing expectations and roles (see for literature about transitions Collins, 1994; Collins, 1995; Collins & Laursen, 2004; Erikson, 1968; Granic, Dishion, & Hollenstein, 2003; Grotevant & Cooper, 1986; Smetana, 1989; Smetana & Asquith, 1994).

The second element in Erikson's definition is the need of being and remaining identifiable for others as well as for oneself, i.e. in one's own subjective experience (Bosma, 1995; Bosma & Gerlsma, 2003). Which aspects serve as "identifiers" of a person, however, depends largely on the context (take for instance a police agent asking for the personal ID or DNA-profile in comparison with how one is identified as psychologist or parent). In fact, identity is the fit between person and context and both person and context interact and "negotiate" which identifiers are relevant (Bosma, 1995). Being and remaining identifiable for others as well as for oneself is expressed in the balance between self and others, as suggested by Erikson:

"The young person, in order to experience wholeness, must feel a progressive continuity . . . between that which he conceives himself to be and that which he perceives others to see in him and expect of him. . ." (Erikson, 1968, p. 98).

"That which he conceives himself to be" and "that which he perceives others to see in him and expect of him" demonstrate the tension between self-determination and being determined by others and by their expectancies. For the individual it is important to develop a sense of self-delineation and self-determination within the connectedness and relatedness with relevant others. The recognition of the dialectic tension between the self and others goes back to the theory of Mead (1934) and can be found in various theories about identity and self (Bosma, 1995; Bosma & Gerlsma, 2003; Bosma & Van Halen, 1999; Grotevant & Cooper, 1985, 1986; Hermans, 2001; Hermans & Hermans-Jansen, 2001; Kroger, 2003, 2004; Verhofstadt-Deneve, 2003).

Working definition of identity

All the elements discussed in the preceding section can be brought together in a working definition of identity. Our working definition of identity describes the main features that should be present for us to recognize a psychological phenomenon as an instance of "identity". Remember that we will need this working definition to develop the conceptual framework and organize existing literature on identity and find unfilled slots that require further research. Our working definition is as follows:

Identity refers to a maintaining 'self-sameness' and continuity through changes and movements across time and space. Self-sameness is for one part determined by the person himself. For the other part it is largely defined and affected by others and the relationships with them.

This working definition of identity contains the two important elements of identity, as described in the previous section and which can be found, to a greater or lesser extent, in the theoretical and empirical approaches to identity within developmental psychology.

After having specified some of the important elements of identity, we move on to the question about the processes: how does identity develop? What did Erikson—whose work we took as the main source of our practically applicable working definition—say about the process of identity formation?

The process of identity development

The theory of Erik Erikson (1968, 1977) places identity within a life cycle perspective. His psychosocial developmental framework consists of different stages or crises over the course of life. Identity formation is the critical task during adolescence and it ". . . begins where the usefulness of identifica-

tion ends. It arises from the selective repudiation and mutual assimilation of childhood identifications and their absorption in a new configuration. . .” (Erikson, 1968, p. 159). Societies provide the freedom and space for (the majority of) their adolescents to freely explore and experiment with different roles and identity images without having to make commitments yet. This phase of transition, delay and experimentation is called psychosocial moratorium (Erikson, 1968). Undergoing a period of moratorium serves an important function in creating and forming one’s own choices and decisions and will eventually lead to the formation of commitments. If the moratorium failed “. . .the individual is defined too early, and has committed himself because circumstances or, indeed, authorities have committed him” (Erikson, 1968, p. 158). James Marcia (1993) took the two elements, commitment and exploration, as the building blocks of his theory on ego identity statuses (his theory will be discussed in more detail in Macro-static approaches).

Following his life cycle perspective, Erikson argued that the process of identity formation is a lifelong and open process. This open-ended notion of the identity formation process consequently results in a conception of identity as an open and dynamic construct; “. . .identity is never ‘established’ as an ‘achievement’ in the form of a personality armor, or of anything static and unchangeable” (Erikson, 1968, p. 24). Erikson furthermore emphasized the transactional nature of identity development. Identity formation involves the continuous interaction between person and context: it is “. . . a process ‘located’ in the core of the individual and yet also in the core of his communal culture. . .” (Erikson, 1968, p. 22). The identity formation of a person is always inextricably interwoven with his or her immediate and wider context. Person and context become inseparable in the process of development: “. . . ‘former’ environments are forever in us. . .” (Erikson, 1968, p. 24). The last important aspect of identity formation is the fact that it is “. . .taking place on all levels of mental functioning. . .” (Erikson, 1968, p. 22). We already mentioned that identity formation is a process that can be highly conscious and apperceived by people, and yet at other times, it can unfold itself in a very unconscious and implicit way.

A theory that explicitly deals with the process of identity exploration and its concrete expression within family relations—the interaction of person and context—is the theory of Grotevant and Cooper (1985, 1986, 1998; see also Grotevant, 1987). In the next section, we will focus on their work about the process of identity exploration. Furthermore, we will discuss the concept of autonomy and its link with identity development.

The role of autonomy/individuality and connectedness within the process of identity exploration

The model of Grotevant and Cooper (1985, 1986, 1998; Grotevant, 1987) is based “. . .on the premise that security in adolescents’ relationships with their parents will be most predictive of adolescents’ abilities to explore their sense of self, identity and the future” (Grotevant & Cooper, 1998, p. 6). Parents should provide adolescents with space and the opportunity to be distinct from others and to develop and formulate their own point of view and ideas. Grotevant’s and Cooper’s work focuses on the interactional perspective of identity development. The central theme is the balance between individuality and connectedness within relationships. Individuality on the one hand is composed of two dimensions, self-assertion and separateness. Connectedness on the other hand consists of permeability and mutuality (see for a more elaborate description Grotevant & Cooper, 1985, 1986, 1998). A positive balance and interplay of both qualities—connectedness and individuality—is summarized in a property called individuation. Individuation is not an individual quality, however, it is the property of a relationship that exhibits both individuality and connectedness. Individuality and connectedness are not seen as mutually exclusive properties. Rather, it is the balance between the two that predicts better developmental outcomes. Grotevant and Cooper’s research has shown that adolescents who scored highest on an identity exploration measure were adolescents coming from families where interactions showed high levels of connectedness as well as individuality (Grotevant & Cooper, 1998). That is, interactions in which adolescents are encouraged to express their views and formulate their needs within a warm and supportive context.

Thus, if one wishes to study the identity development of adolescents within the relationship with parents, one has to focus on the interplay of individuality and connectedness. Theories in the tradition of autonomy development are also important in this respect (Collins, Gleason, & Sesma, 1997; Deci & Ryan, 2000; Steinberg, 1990; see for a review Zimmer-Gembeck & Collins, 2003). Even if they are not

directly linked with identity theories, they do focus—just as the work of Grotevant and Cooper does—on the balance between autonomy and connectedness. That is, they focus on the balance between self and other. In this article we follow the definition of autonomy as it is defined within the self-determination theory of Ryan and Deci (2000). “Autonomy involves being volitional, acting from one’s sense of self and endorsing one’s action. It does not entail being separate from, not relying upon, or being independent from others” (Ryan & Deci, 2000, p. 242). The opposite of autonomy within this framework is heteronomy, which entails regulation and determination from outside the self (Ryan & Deci, 2000, 2006). From here it follows that autonomy in this sense is not defined as opposed to relatedness or connectedness (see also the work of Grotevant & Cooper, 1985, 1986; Kagitçibasi, 1996, 1999, 2005; Kantor & Lehr, 1975). The definition of Ryan and Deci nicely illustrates the link between autonomy and identity especially during adolescence. During this period we see an increased striving for autonomy (Smetana, 1989; Smetana & Asquith, 1994). Several factors have been linked to the autonomy strivings of adolescents, such as increases in cognitive and verbal competence of the adolescent, changes of adolescents’ expectation due to pubertal growth, increasing experience with symmetric relationships and interactions (peers), and an age-related decrease in parental control (Pinquart & Silbereisen, 2002; see for an overview Zimmer-Gembeck & Collins, 2003). The enhanced striving for autonomy can be interpreted as an attempt to create room and space to explore one’s own identity. It is like a pre-stage and forerunner of identity development, aimed at creating a self-determined space for exploration. Autonomy might not be a necessary pre-stage, however. Adolescents can develop an identity without a phase of exploration, but the exploration is an essential precursor of a self-determined identity (compare this with the work of Marcia and the difference between the achieved and foreclosed identity status).

A framework for time

The working definition of identity as sameness through changes necessarily and explicitly involves the notion of time. Identity concerns the simultaneity of changing and remaining the same over time. In the course of time, the little boy has to become a big boy, but his mother will always identify him as her once so little boy (Erikson, 1968). Explicitly mentioning the importance of including time seems trivial and obvious, in particular in the context of development. However, even a quick glance over the current psychological research questions and methods shows that psychology has “. . . transformed itself into a science where basically a-temporal relationships between variables distributed across groups now abound” (Van Geert, 2006, p. 488; see also Valsiner, 1998). In this article we will use the time aspect to create a conceptual framework for identity in which existing theories and research can be given a specific place or location. The presented framework consists of two dimensions which are both related to the notion of time.

The micro–macro dimension

The first dimension distinguishes between distinct time scales across which identity and identity formation evolves. Time can be defined at several levels and the expression and manifestation of a phenomenon under study varies with the time-level chosen (Valsiner, 1998; Van Geert, 2006). Phenomena can be measured across months and years or they can be studied within days, minutes and seconds. Development can be conceptualized on several time levels (Lemke, 2000; Van Geert, 2006; Van Geert & Fischer, 2007). On the one hand, there is an aggregated time level which describes changes across long-time intervals involving years and decades. With *aggregated* we mean that the measures represent summaries across time of different contexts as compared to measures or observations that follow the daily flow of a phenomenon. The aggregated time level is used to describe developmental changes and we will call this level the *macro* level. On the other hand there is the *micro* level, which is the level where concrete experiences take place, actions and interactions are carried out, and which involves minutes to hours to days (compare Lewis, 1995; but also in the work of early developmental thinkers like Vygotsky, Werner and Wertsch, in Van Geert, 1998). Macro level and micro level are not absolute distinctions in that there is no exact limit at which one changes into the other. The

boundary is fuzzy, but real, basically because it corresponds with qualitative differences in the nature of the mechanisms that govern the events at the time scales concerned. For instance, the mechanisms behind a minute-based event like having a conflict about going out are different from those behind the decade-based event of identity formation from early adolescence to adulthood. The first is primarily governed by explicit short-term goal representations and resulting functional actions, e.g. importance of the goal, emotions, thoughts and behavior. The second is primarily governed by long-term representations and distal mechanisms, e.g. bodily changes that are beyond the person's direct control. In short, the existence of different time scales is based on the difference in the nature of the processes and mechanisms that occur on these time scales. The boundaries are fuzzy, not crisp.

In the case of identity research, we do believe that a meaningful distinction between macro and micro level could be defined based on the aspects of identity one wants to study. Most of the events relating to identity will involve direct, non-reflective actions. People express their identity in real-time actions, experiences and interactions without being explicitly aware of their identity. We call this level the expression of identity. Thus, it is about the expression of identity in real-time, i.e. the micro level, where explicit reflection is the exception rather than the rule. On the other hand, the macro level of identity typically requires the person to explicitly reflect on what the person considers stable and characteristic features of his or her identity. That is, the focus lies on the generalizations and compressions of information that people themselves are likely to make. This is why we call this level the reflective level of identity. In order to study the process on the aggregated level of identity development (macro level), questionnaires and interviews are used to measure people's reflections and abstractions about their own identity. We thus refer to an *expression-focused* level, which is the micro level and a *reflection-focused* level, which is the macro level, with the explicit understanding that expression and reflection occur on both levels, but with different emphasis.

The static–dynamic dimension

The second dimension of our conceptual framework discriminates between approaches to study identity and its development that we identify through the terms *static* and *dynamic* approaches. We use this dimension to contrast two prototypical and different approaches within developmental psychology in terms of their applied methodology, the underlying questions and the explanatory target in terms of theory formation. Comparable with the first dimension, which distinguished among various time scales that can be used to study psychological phenomena (e.g. identity), time also plays an important role in the second dimension. However, the second dimension involves the distinction between approaches that focus on change (dynamic) versus approaches that focus on associations between variables or properties (static).

We use the term static approaches to refer to approaches that rely on the association between one dependent or outcome variable (e.g. identity status) and one or several independent variables (e.g. family climate), at a particular point in time (Howe & Lewis, 2005; Van Geert & Steenbeek, 2005). An example of a static relationship is a correlation, which is used to specify the structural relationship or association between variables in a sample. The major property of a static relationship is that it associates a value of some dependent variable (e.g. some level on an identity test) to a value on some independent variable (e.g. a particular family climate level) without any reference to events that occurred earlier in time (Howe & Lewis, 2005). Without loss of generality, static relationships may hold between one (dependent) variable and one other (independent) variable, or one dependent variable and many other independent variables.

In our conceptual framework these static approaches are set off against dynamic approaches within developmental psychology. In contrast to static approaches where the explanatory target lies in the structural association between variables without any reference to the underlying process of change, dynamic approaches focus on how in the course of time-one state¹ of the system (which consists at least of one state variable) evolves into another state of that system. Thus, the methodological claim

¹ It is important to note that with *state* we do not mean something that remains constant for some length of time like a stage or phase. State is the property of a variable or system at a particular moment in time and space and may thus change or fluctuate over any time interval (see also Van Gelder, 1998).

underlying dynamic approaches is that development has to be understood by studying the time evolution or iterative process of the system, i.e. the current state of the system depends—besides external influences—on its previous states (Howe & Lewis, 2005; Norton, 1995; Nesselroade & Schmidt McCollam, 2000; Nowak, Vallacher, & Zochowski, 2005; Van Geert & Steenbeek, 2005; Van Gelder, 1998; Weisstein, 1999). It is “. . . an attempt to formulate a more precise (either quantitative or qualitative) relation between an increasing time parameter and specific measurable elements of the system” (Norton, 1995, p. 45). This means that variables are entering a functional relationship, instead of an associative a-temporal relationship as in static approaches. Consequently, the explanatory target of dynamic approaches lies in the description of the underlying dynamic, i.e. the mechanism that explains the evolution of the system over time (Gottman, Murray, Swanson, Tyson, & Swanson, 2002a). Thus, dynamic approaches specify an explicit rule, mechanism or law that explains the trajectories of the system over time (Broer & Takens, *in press*; Eckstein, 2000; Van Gelder, 1998; Van Gelder & Port, 1995; Van Geert & Steenbeek, 2005). In this sense dynamic approaches can be seen as models of change. All kinds of time-serial methods (such as growth curve analyses, Markov chains, dynamic factor analysis, etc.) as well as dynamic systems oriented methods can be grouped under the term dynamic approaches.

In developmental psychology, many studies associate the dependent variable (e.g. identity or commitment making) to the independent variable “time”, for instance in the form of linear regression models with time as independent variable. Thus, in order to keep our distinction between static and dynamic approaches consistent, static models apply to any association between variables except the association with time. However, although any model that expresses a variable as a function of time must necessarily qualify as a dynamic model, we wish to include a number of additional qualifications in order to distinguish a dynamic model *per se* from a descriptively adequate developmental dynamic model. The term descriptive adequacy stems from Chomskyan linguistics (Chomsky, 1957). A model (description or theory) is descriptively adequate if it captures the “essential” features of the phenomenon it addresses. Since it is difficult to agree on what the essential features of some sort of phenomenon are (e.g. the development of identity), it is easier to define a model as *not* descriptively adequate if it leaves out or is incompatible with at least one feature of the phenomenon that is generally accepted as “essential”. We characterize a dynamic model as developmentally descriptively adequate if the mechanism implied in the dynamic model (1) corresponds with a developmentally plausible mechanism, (2) in principle applies to the whole developmental time scale.

First, with developmentally plausible we mean that the mechanism directly refers to a theoretically driven functional relationship (i.e. a relationship justified by a developmental theory or theory of change). In other words the specified mechanism has to be based on adequate (in a theoretical sense) assumptions regarding the nature and timeframe of the phenomena under study (Gottman et al., 2002a, 2002b; Van Geert, 1998). Examples of these theory-driven dynamic approaches can be found in the literature (e.g. Gottman et al., 2002b; Steenbeek & Van Geert, 2007; Thelen & Smith, 1994; Nowak et al., 2005; Van Geert, 1991, 1998). In the search for this functional relationship or “dynamic law”, time-serial or time-dependent models can be used to gather information about the underlying dynamic system generating it (see the reconstruction theorem in Broer & Takens, *in press*). The fact that a particular time-serial or time-dependent model can have a high goodness-of-fit with the collected data does not in itself augment the theoretical plausibility of the underlying dynamic mechanism (see Boker & Graham, 1998 for a similar argument). Gottman et al. (2002a) for instance, suggested that goodness-of-fit should not be seen as the “sine qua non of science” (p. 68) and that “fitting the data does not tell that you have the right mechanism” (p. 67). In contrast, the essential question should be whether the chosen model parameters are based on a theoretical understanding of the phenomena. A famous physicist—John von Neumann—once replayed to the arbitrary nature of model parameters: “. . . with four parameters I can fit an elephant, and with five I can make him wiggle his trunk” (as quoted by Freeman, 2004, p. 297).

Second, the requirement that the mechanism should be applicable to the developmental time scale can best be explained by means of an example. For instance, if commitment making (see Luyckx, Goossens, & Soenens, 2006) is seen as a developmental variable that begins from some initial level, then increases and then levels off towards a more or less stable level, the dynamic mechanism invoked to explain the change in commitment making over developmental time should be able to account for the increase as well as the later stabilization and maintenance over time. Studies have shown that

over a relatively limited stretch of time (e.g. two years) increase in commitment making can best be described by a latent growth curve model that takes the form of a linear regression model of time (Luyckx et al., 2006). A linear regression model describes change as a process of constant increase (which can be easily shown by taking the first derivative of the linear regression model). If applied across the entire developmental time scale, the linear model will predict constant increase and not the leveling off and stabilization that is considered characteristic of the developmental trajectory. In that case, the developmental mechanism implicitly intended by the dynamic model (the linear regression model) is not descriptively adequate within the developmental time scale of identity development (unless it invokes some additional principle to explain the stabilization, in which case it demonstrates its incompleteness). One way out of this difficulty is to admit that the time-dependent model does not serve as a model of the underlying developmental mechanism, which is more or less the viewpoint taken by Luyckx et al. (2006), who state that they do not focus on "...the exact processes or mechanisms that accounted for the observed differences in identity development..." (p. 378). In that case, the time-dependent model, although formally of a dynamic nature, comes close to a static model by confining itself to specifying an association between the dependent variable (e.g. commitment making) and time without the intention of viewing the change or evolution term (e.g. the constant increase in the case of a linear model) as representative of an underlying developmental mechanism.

The two-dimensional framework

In sum, the framework we propose consists of two dimensions that are related to the notion of time. One dimension represents the different time scales that can be used in order to study phenomena and their development. It is a semi-continuous dimension ranging from a macro level to a micro level, with micro and macro defined by the nature of the corresponding mechanisms of change. In the case of identity theories micro and macro are further defined by the distinction between a focus on the expression of identity (micro level) and a focus on the reflection on identity (macro level). The other axis distinguishes between static and dynamic approaches to study phenomena and their development. The proposed framework is a very general framework, the two axes reflect meta-dimensions that represent the way we perceive and order reality. In its simplest possible form, the framework consists of a two-by-two matrix, specifying the four quadrants *macro-static*, *macro-dynamic*, *micro-static* and *micro-dynamic* approaches. See Fig. 1 for a brief summary of the most important differences between the quadrants.

This conceptual framework can be used to categorize all kinds of psychological phenomena and constructs. In the following we will argue that it is also very useful to organize and map existing theories and research about identity development in adolescence. All the above described elements of identity, sameness within change, self versus others and so on, can be studied either from a macro-static, micro-static, macro-dynamic or micro-dynamic perspective. We believe that our framework contributes to the field of developmental psychology and identity development in particular, because it helps us to describe the space of existing research. Each quadrant in the matrix corresponds to particular approaches within the field that have their specific value and unique contribution to our understanding of identity development. The strength of our framework is that it organizes existing theories according to how they relate to and operationalize development. In addition it enables us to spot and define empty slots within the descriptive field of identity, which would suggest that the picture of identity is incomplete.

It is important, however, to understand that answers to questions from one quadrant are not by themselves answers to questions from another quadrant, even if those questions look, superficially, the same. Before applying the framework to existing research and theories, we want to address why it might be dangerous to generalize from one quadrant of the field to another quadrant.

Problems and pitfalls in existing research

To begin with, a macroscopic conceptualization of identity serves well in order to study the long-term evolution and outcomes of the identity process. But the macroscopic property identity

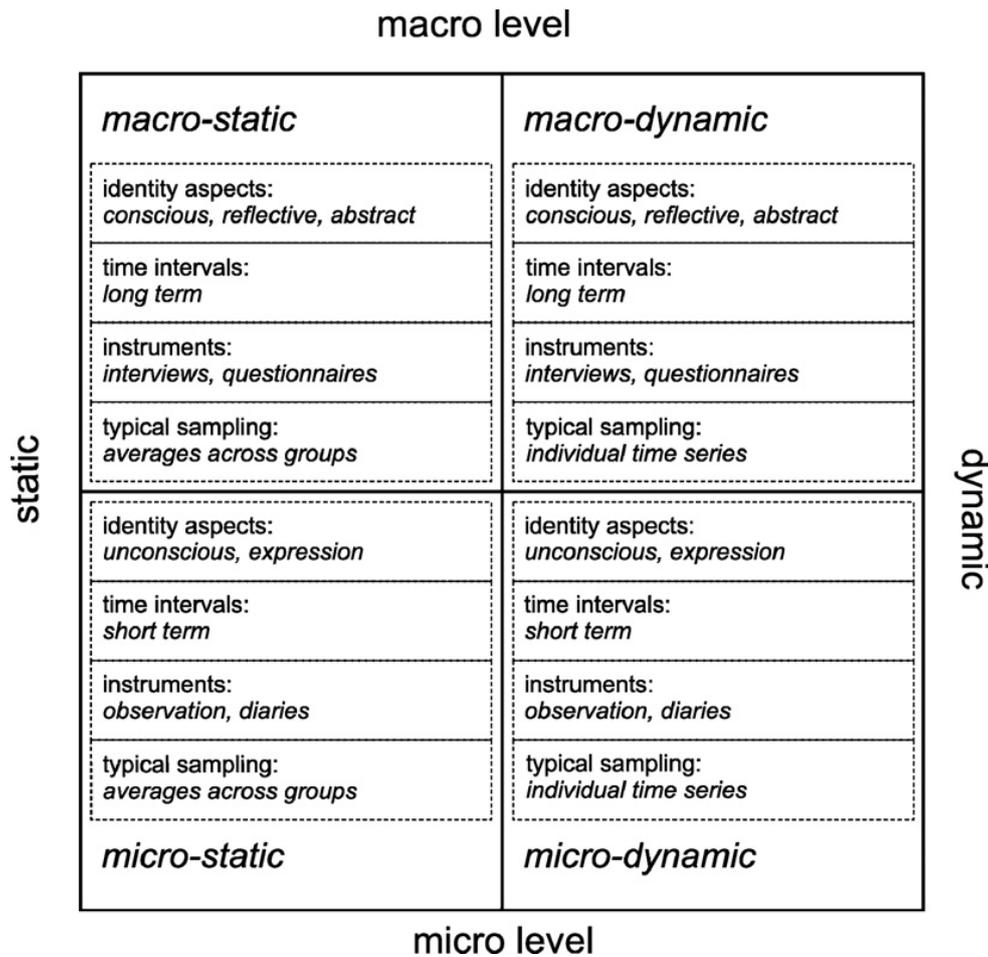


Fig. 1. The two-dimensional framework for the study of identity.

does not operate like a little engine in the heads of individuals driving their real-time actions, thoughts and emotions (Van Geert & Steenbeek, 2005). "...It would clearly be an error to represent identity as in some way the prime or ultimate determiner of action. Identity itself is a product of social interaction" (Breakwell, 1986, p. 43). Macroscopic structures, like identity, emerge out of microscopic interactions, i.e. out of real-time activities, dyadic interactions and so forth on the short-term time scale of minutes to hours to days. At the same time these micro level processes are being constrained and restricted by the macroscopic structure (we will discuss this in more detail in Integration: a dynamic systems perspective—from micro to macro and dynamic to static). Important here is that because of this reciprocal relationship between micro level processes and macroscopic structures, direct cross-generalizations across different time scales are in fact problematic. An example of such problematic application is when the aggregated concept is used as a short-term mechanism, the "little engine in the head", which is often implicitly done in existing research. Properties of one time scale, i.e. the macro scale, are being projected directly onto the micro time scale, in the form of a dedicated short-term operating process (the structure of which is homologous to the long-term structure). An illustration of this point from the field of autonomy research is the traditional way to study the role of conflicts in the development of autonomy. The role of conflicts in autonomy development has often been defined by means of the frequency of conflicts (see for similar argument Granic et al., 2003). Pardeck and Pardeck (1990) asked the question of how much conflict is functional in the promotion of adolescent autonomy and concluded with the statement that "...a moderate degree of conflict, particularly during early adolescence, appears to be important to the development of adolescent autonomy" (Pardeck & Pardeck, 1990, p. 315). Thus, various real-time conflicts are being summarized into an aggregated frequency count and that macroscopic feature is then used to predict another aggregated concept, namely auton-

omy. Autonomy is measured by means of questionnaires picturing the reflective aspect of autonomy. On this aggregated level, autonomy is rather stable and slowly changing. But it is *not* an internal executive structure operating in the head of the adolescent and directly influencing his or her behavior during a real-time conflict. In a real-time conflict, the adolescent's expression of or striving for autonomy is governed by the immediate, proximal short-term mechanisms and context, like the importance of the goal threatened during conflict, the course of the interaction and the accompanying emotions and thoughts. Thus, the first important step in dealing with the conceptualization of constructs like autonomy or identity is to keep the dynamics on differing time-scales separate that is, distinct but linkable.

The second dimension of our conceptual framework, static versus dynamic approaches, highlights another point of attention, especially relevant for the field of developmental psychology, a field that should, almost by definition, be interested in processes over time. As has been said earlier, it makes a difference whether you want to know about the association and structural relationships between different variables (static approaches) or whether you are interested in the process, i.e. the time evolution of a system (dynamic approaches). The first question could be asked by a policy maker who wants to know, because of economic interests, which therapies or interventions work best in facilitating identity development. Take again the example of the development of a certain aspect of identity. Following a static approach we would get a function that explains the variation in this identity aspect with the variation of another variable, e.g. across different age groups in a cross-sectional design. This results in the distribution of the identity aspect across different age groups. Can we generalize this relationship across age to the time evolution process of the same identity aspect within one individual? Is the distribution across different ages the same as any individual trajectory in the sample? These would be typical questions for a therapist working with the individual adolescent. Molenaar (2004) argues that in most developmental processes relations found on a group level can differ greatly from the associations on an individual level (see also Hamaker, Dolan, & Molenaar, 2005). This has to do with the fact that most developmental processes are non-ergodic, i.e. they vary in their mean function, variance and sequential dependencies (Molenaar, Rovine, Ram, & Corneal, 2007). Only for ergodic processes, i.e. stationary processes where every subject in the population obeys the same dynamics, there exists a lawful relationship between the structure of intra-individual variation and inter-individual variation. Therefore findings based on populations can be validly generalized to the individual. In non-ergodic processes, however, no such relationship exists, and for that reason generalizations to the individual realm have to be made with great caution if at all (see also Hamaker et al., 2005). This means that the therapist working with the individual adolescent to facilitate his or her identity development must be very cautious with the use of group-based findings derived from static approaches. Group-based distributions and relationships are subject to different laws and dynamics than individual-based time evolution processes. Dynamic approaches try to dismantle the underlying mechanism and dynamics of the process. Only both approaches together can lead to a full understanding of identity processes and its development and both approaches have their unique contribution and allow for different conclusions.

Existing research in the time and identity framework

In this section we will briefly summarize existing research about adolescent identity development and we will try to categorize it according to the proposed conceptual framework. The literature review does not intend to be complete; it serves as an illustration and clarification of the proposed framework. Moreover we are aware that this framework is not the only way identity theories and research can be categorized. Recently Schwartz (2001) published an extensive and critical review on the evolution of Eriksonian and Neo-Eriksonian identity theory. He suggested a framework based on the distinction between process models versus structure models, which is comparable to our static–dynamic dimension. However, our framework adds the criterion of adequacy in that a process model is only qualified as dynamic if the process model is used as a model of change that adequately describes the underlying developmental mechanism.

Macro-static approaches

The most prominent operationalization of ego identity development during adolescence is Marcia's identity status model (Marcia, Waterman, Matteson, Archer, & Orlofsky, 1993). Marcia's approach has generated more than 500 publications across the last decades (Kroger, 2004) and has set its stamp on the conceptualization of identity within developmental psychology. The basic idea behind the model is that adolescents, in order to be able to take a mature role and position in society, have to make and invest in personal choices, called commitments concerning life domains, e.g. education, life choices, politics, friendships (Marcia et al., 1993). Deliberate and personal commitments are formed on the basis of exploration. Based on exploration and commitment the model specifies four different identity statuses (the statuses are foreclosure, diffusion, achievement and moratorium, see for a more detailed description Marcia, 1993). The developmental hypothesis of the status paradigm is that identity development "... involves progressive strengthening in the sense of identity" (Waterman, 1993, p. 42) and there is empirical evidence suggesting a progressive movement from foreclosure and diffusion to moratorium and achievement (Kroger, 2004). Within the identity status paradigm, identity is conceptualized as an internal structure which becomes stabilized within the course of development.

The status model of Marcia is a typical example of a macroscopic approach to identity. Identity is operationalized by commitments, which by their very nature represent a reflective and conscious aspect of someone's identity. The measures ask people to formulate their commitments towards certain life areas, thus averaging over many concrete choices, decisions and thoughts. Most of the existing research within Marcia's paradigm focuses on correlates of the identity statuses (Marcia et al., 1993; see for an overview Meeus, 1996; Schwartz, 2001) and are therefore classified as static approaches.

Nowadays important refinements of Marcia's approach have been made (Meeus, Iedema, & Maassen, 2002; see for overviews Schwartz, 2001; Van Hoof, 1999). Important in this respect is the work of Luyckx et al. (2006), which we have already briefly discussed in the static–dynamic dimension. The authors developed a dual cycle model of identity formation that places greater emphasis on the developmental aspects of identity development. They integrated the classical paradigm of Marcia with more recent views on identity formation. The two cycles consist of, on the one hand, exploration in breadth and commitment making (Marcia's paradigm) and, on the other hand, exploration in depth (exploring in depth already existing commitments) and identification with commitments. These two cycles are interwoven and dynamically interact in the process of identity formation (Luyckx et al., 2006). Before commitments are made, exploration in breadth is important in order to explore possible alternatives. After a commitment is made, exploration in depth is important because it serves the strengthening or re-evaluation of existing commitments. In this sense the authors define identity formation as an iterative process of feedback loops and reciprocal cycles that influence one another (Luyckx et al., 2006). Another important extension to Marcia's original theory is the theory of Berzonsky on identity styles (1990). The theory focuses on information processing and the way people tend to deal with self-relevant information. Berzonsky (1990) challenges the view that identity is an outcome represented in terms of an unitary structure. In contrast to this, he advocates a view of identity development as a process of construction and reconstruction. Self-identity is conceptualized as a self-generated theory of self and people can differ in the way they generate and process self-relevant information. On the basis of differences in personal decision making and problem solving, Berzonsky (1990) developed three different identity styles. The identity styles represent self-reported differences in strategies people tend to prefer when dealing with self-relevant issues and making personal commitments. The three different identity styles are information-oriented, normative-oriented and diffuse-oriented, respectively (for a more elaborate description see Berzonsky, 1990). The identity style approach has influenced much research and the styles have been shown to be meaningfully related to a lot of outcome variables (Berzonsky, 2003).

The dual cycle model as well as the identity styles focus on the reflective aspects of identity which are studied by means of questionnaires. Therefore these approaches are clear examples of a macroscopic conceptualization of identity. In the existing literature identity styles are related to outcome variables; in this respect this line of research can be qualified as static approaches. The Luyckx et al. study on the other hand is a bit more difficult to classify. Theoretically, the authors clearly describe a dynamic model of identity formation: an iterative process of interacting cycles, i.e. exploration

in breath and exploration in depth. Empirically, however, this study combines static and dynamic aspects. The dynamic aspect of this study is the estimation of individual parameters of change (intercept and slope) which specify the individual growth curves of e.g. commitment making. The static aspects of the Luyckx et al. study lie in the fact that the authors do not focus on “. . . the exact processes or mechanisms. . .” (p. 378) but on the association between the growth curves of the different identity dimensions. Thus, this kind of approach represents a combination of static and dynamic aspects but we group it under static approaches because the basic results and conclusions are correlational or associative in nature. Moreover the study falls short in describing the underlying developmental mechanism as we have outlined in the static–dynamic dimension, another reason why we qualify that approach as static. This discrepancy between a dynamic theory and static approaches (or a combination of static and dynamic approaches) is characteristic of many studies within the field of developmental psychology.

Finally, there is a research tradition around the process of how parents and adolescents negotiate the balance between autonomy and connectedness (see Zimmer-Gembeck & Collins, 2003 for an overview). As we have argued before, the striving for autonomy can be seen as a necessary precursor to create space to be able to explore one's own identity and sense of self. The specific challenge for parents and adolescents is to overcome the childlike relationship marked by connectedness and dependency and to transform it into a more independent and autonomous relationship where one still feels connected and attached (Beyers, Goossens, Vansant, & Moors, 2003; Grotevant & Cooper, 1985, 1986; Meeus, Iedema, Maassen, & Engels, 2005; Smetana, 1995). Autonomy within connectedness has been linked to several positive outcomes, such as psychological health and maturity (Noom, Dekovic, & Meeus, 1999) more mature forms of intimacy (see Kroger in Bosma & Gerlsma, 2003) and more positive social relationships (McElhaney & Allen, 2001). For an extensive review of parental behavior related to autonomy see Zimmer-Gembeck and Collins (2003).

Also these studies can be mapped onto the macro-static quadrant of the framework. Autonomy and connectedness are measured by means of questionnaires that ask people to reflect upon these constructs and aggregate them across time and contexts. Thus, the focus lies on the reflective aspects of autonomy and connectedness. The studies are defined as static because autonomy is related in a static way, by means of correlations, to various outcome variables.

Micro-static approaches

The work of Grotevant and Cooper (1985, 1986, 1998) provides an important example of the theories and researches that occupy the micro-static field of the framework. They were among the first who focused on communication processes and behavioral indices in order to study the process of individuation in family relationships, and its relation to identity exploration (see for a more elaborate description Grotevant & Cooper, 1985, 1986, but also Bengtson & Grotevant, 1999). The authors coded family real-time interactions on the basis of the expression of these dual processes and investigated the interplay between individuality and connectedness and their effects on the identity formation of the adolescent. In addition, Piquart and Silbereisen (2002) investigated the observed changes in behavioral indicators of autonomy and connectedness in conflict discussions across adolescence. A study, conducted by Vuchinich, Angelelli, and Gatherum (1996), provides insight into the link between family conflict processes and autonomy striving by studying problem solving components across adolescence. A study done by Penington (2004) explicitly addresses the question of strategies used by mothers and daughters to manage issues of autonomy and connectedness. Strategies like apologizing after conflict, willingness to compromise and talk it out, were found to reestablish connectedness after conflict (Penington, 2004).

The above mentioned studies can be mapped onto the micro-static quadrant of the framework. Instead of studying people's reflections and self-reports on identity they investigate the real-time aspects of identity and the expression and negotiation of autonomy strivings. This level of analysis reflects the expression of identity on a micro level. The above mentioned authors do not study the time evolution of these variables; therefore they are called static approaches. Behavioral indicators of autonomy and connectedness, as in the case of the Piquart and Silbereisen study, are lumped to-

gether into overall codes per conflict session; by doing so the sequential analysis of the time-serial process gets lost (Pinquart & Silbereisen, 2002).

Macro-dynamic approaches

Kunnen and Bosma (2000; Kunnen, Bosma, & Van Geert, 2001) developed a theoretical model aimed to explain the mechanisms involved in identity changes and transitions. The model is developed on the basis of reviewed literature and it is inspired by the work of process-oriented approaches to identity, such as the theory of Grotevant and Cooper, Kroger, Adams and Marshall, Kerpelman and Breakwell (see Bosma & Kunnen, 2001a, 2001b). These theories focus on the process of identity development, its transactional nature, and its contextual embeddedness. In line with a variety of theories, the important basis of that model is the iterative nature of identity development. “Iterative means that a same mechanism is repeated again and again, while in each loop, the starting point is the outcome of the previous iteration.” (Bosma & Kunnen, 2001b, p. 59). Iteration is the interaction between context and person, or in the case of identity, the existing commitment of a person and information from the environment about this commitment. During the transaction the outside and inside information are being matched, which either results in a fit or a mismatch and conflict. Conflicts form a threat to existing structures and are therefore supposed to trigger change (this is similar to the mismatch between feedback and identity standards in the identity control theory of Kerpelman, Pittman, & Lamke, 1997, or the interruption of identity processes in the model of Burke, 1991). Bosma and Kunnen state that conflicts are only the starting point of the process, whether it will lead to changes or not, will depend on the action that follows. Actions undertaken to deal with threats can be divided into assimilation or accommodation strategies. Assimilation is probably the first attempt to resolve the conflict and involves changes in the perception or interpretation of the environment. If assimilation is unsuccessful, accommodation will be the next step. Accommodation means that the person has to adjust his own identity, which only occurs in the long run when a person is confronted with an ongoing conflict. Withdrawal and escape from certain environmental demands is a third strategy in order to deal with conflicts (Kunnen & Bosma, 2000). The authors describe a dynamic systems model, which can capture the process of commitment formation. Simulations based on this dynamic systems model can predict different trajectories. Also Kroger (2003) argues for the use of dynamic systems methods, like Markov-chain models and simulation techniques in order to study identity status transitions. She argues that such dynamic systems methods will contribute to the discussion and understanding of movement patterns and development over time.

The theoretical model of Bosma and Kunnen operates on a macro level, since it concerns commitments or the level of meaning making. As mentioned above, commitments are, by their very nature, macroscopic variables because they represent reflective and conscious aspect of someone’s identity. What makes the model dynamic is the fact that the authors focus on the change of commitments on the basis of an iterative mechanism, consisting of person–context interactions. Every outcome of the interaction is taken as starting point for the new interaction. This means that a certain commitment at a certain point in time is the result of the evolution process of this commitment over time. Moreover the mechanism of change applies to the entire time scale of interest (long term development) and is theoretically plausible, i.e. grounded in general principles of change and development.

Micro-dynamic approaches

A theory that focuses on the micro level processes of adolescent identity development is the theory of Kerpelman et al. (1997). Based on a control theory approach they combine intrapersonal factors, such as identity standards and self-perceptions, with interpersonal factors, such as interpersonal feedback and social behaviors. A disturbance occurs whenever there is a mismatch between “inside” and “outside” information, e.g. identity standards and interpersonal feedback (compare with the Bosma & Kunnen model in the previous section). This disturbance can lead to experiences of emotional distress (see also Burke, 1991). Behavior is aimed at dealing with the disturbance, for example by eliciting social feedback that is in accordance with existing identity standards. Support for this model comes from self-verification experiments (Kerpelman & Pittman, 2001). In these experiments friends’ interactions

in reaction to an experimental feedback were video-taped and analyzed. Among other variables the authors were interested in self-verification efforts that reflect the participants' responses to the feedback.

The approach of Kerpelman et al. focuses on the micro level aspects of identity, since they are measuring the behavioral expressions of identity, e.g. eliciting congruent feedback. Their theory is formulated in a dynamic sense, which is specifying a mechanism for identity change, e.g. a disturbance of identity standards. The methods that are used to support the model are experimental studies. Experimental studies focus on a single iterative sweep of the process, so to speak. Thus, the experimental manipulation is the antecedent, the subjects' response to it the consequent. In a fully elaborated dynamic approach, the consequent would act as antecedent to yet another step in the process, and so on, for a period of time and a number of iterations that are characteristic of the process under investigation.

A clear example of a micro-dynamic approach is a study done by Vleioras, Van Geert, and Bosma (2007). Instead of focusing on conflicting events the authors studied all kinds of daily experiences and encounters of students who went abroad for a couple of months. The authors investigated the relation between emotions involved in micro level day-to-day experiences and the macroscopic level of commitments. By focusing on the process of daily experiences and related emotions, they were able to conclude that the outcome and coping with these daily experiences and events (micro level), coupled over time, can cause changes in the commitments towards the parents (macro level). Vleioras et al. (2007) developed a dynamic systems model that describes the process by which daily experiences related to friends, parents and perceived competence influence the maturation process of commitments. The process of maturation is a resource-consuming process and resources are provided by these daily encounters with friends and parents. If daily encounters are valued positively they should support the growth process of commitment maturation. Changes in maturity are a function of maturity itself, of a growth rate factor, and of a collection of resources. The dynamic systems model simulates exemplary trajectories of commitment change.

The model proposed by Vleioras et al. is a first important step in understanding the time evolution process of identity formation and its underlying mechanism. The dynamic mechanism applies to the time scale intended and is theoretically plausible; therefore it is defined as a dynamic approach to study identity. Furthermore, this kind of approach reflects the micro level of identity, since it is focusing on the day-to-day experiences, interactions and emotions. People are not asked to reflect upon their identity but they are freely expressing their identity within the diaries.

Concluding remarks

Applying our conceptual framework to the existing identity literature revealed that only one field of the proposed conceptual space is well-stocked, the other areas are rather sparsely filled. Most of the existing research concentrates on the macro-static field of identity and autonomy (see Micro-static approaches). Research focusing on micro level expressions of identity that is at a day-to-day or moment-to-moment level is extremely rare (exceptions see Micro-static approaches and Macro-dynamic approaches). In addition almost no research deals with the dynamic time evolution process of identity development (exceptions see Macro-dynamic approaches and Micro-dynamic approaches), despite the growing critiques from leading theorists that a purely static approach cannot answer the process related questions of identity development and formation (Bosma & Van Halen, 1999; Bosma & Gerlsma, 2003; Bosma & Kunnen, 2001a, 2001b; Grotevant & Cooper, 1985, 1998; Kerpelman et al., 1997; Kroger, 2003; Van Hoof, 1999). The field still lacks knowledge about the micro level processes that are involved in changes and the development of identity. Moreover the mechanisms of change at an individual level remain unexplained (Bosma & Kunnen, 2001a, 2001b; Bosma & Gerlsma, 2003; Kerpelman et al., 1997). Therefore the existing picture and understanding of identity processes and its development is incomplete. The proposed framework enabled us to point out the gaps within the existing research. We believe, that filling *all* the fields of the outlined conceptual space—with models, theories and empirical data—is necessary to arrive at a complete understanding of identity and its development. In the following two sections we will present ways of approaching identity expressions on a micro level and studying their evolution processes over time. Our choice to focus on the micro-

dynamic quadrant of the framework can best be illustrated by a quotation of Granic (2005, p. 391): "...real-time behaviors... are the raw material of development ...and it is moment-to-moment, day-to-day direct experiences, repeated over many occasions, that 'grow' developmental outcomes...". An understanding of the raw material, i.e. the micro level expressions of identity, is essential in order to conceptualize the developmental outcome, i.e. the macro level concept of identity. A dynamic approach—capturing the time evolution process of identity—is necessary in order to understand how identity emerges, stabilizes, and changes over time.

Filling the micro-dynamic quadrant

This section deals with two questions. First, how can we operationalize identity at a micro level? Second, how can we study the micro level identity expressions in a dynamical manner? The ideas that we present in this section are derived from an ongoing study by the authors, where mothers and daughters are followed across one year, by means of diaries that report on their daily conflicts. It goes without saying that there are various other ways to uncover the time evolution process of identity on a micro level.

Micro level expressions of identity

To start, we have to define a context which allows us to study the expression of identity on a micro level. As has been mentioned above, conflicts are seen as an important motor of identity development (Breakwell, 1986, 1988; Burke, 1991; Kerpelman et al., 1997; Kunnen & Bosma, 2000). In addition, interpersonal conflicts are very well suited to study the expression of identity because they provide "a situation in which interdependent people express (manifest or latent) differences in satisfying their individual needs and interests, and they experience interference from each other in accomplishing these goals" (Donohue & Kolt, in Koerner & Fitzpatrick, 2006, p. 161). Therefore one can observe the expression of identity (see Micro-static approaches and Micro-dynamic approaches), instead of asking individuals to reflect upon it. More specifically, interpersonal conflicts allow us to study one particular element of identity, namely the dialectic tension between self and other. That is, the tension between what a person conceives himself to be and that which he perceives others to see in him and expect of him.

During adolescence an essential interpersonal context in terms of identity and autonomy development is the relationship with parents. "...The parent/adolescent relationship is of particular importance because it provides one of the most stable microecologies for adolescent identity development" (Kerpelman et al., 1997, p. 325). The adolescents' attempts to create space for their own identity exploration—becoming distinct and developing their own ideas and beliefs (Grotevant & Cooper, 1985, 1986, 1998) or gaining autonomy (Collins, 1991, 1995; Smetana, 1989, 1995)—can clash with their parents' willingness to provide autonomy (Jackson, Bijstra, Oostra, & Bosma, 1998). In this sense, compared to childhood, adolescence provides a context with a rich set of goal-blocking opportunities for the parent (Granic et al., 2003). Blocked goals and violated expectancies will cause conflict and emotional arousal (among others Collins & Luebker, 1994).

After having defined a suitable context for the study of micro level identity expression in the form of parent–adolescent conflicts; the next question is: How can we operationalize identity or autonomy within such parent–adolescent conflicts? The issues that are at stake in real-time conflicts do not pertain to abstract reflections of identity, but to the actual expression of identity. Identity commitments are high-level, abstract descriptions of relatively firm choices about identity elements. There is a direct link, however, between commitments and the expression of identity as described by Waterman (1993, p. 164): "The activity resulting from identity commitments is directed toward expression or realization of the identity choices that have been made...there should be a sense that the respondent's self-definition is guiding his or her life on a day-to-day or at least month-to-month basis". The micro studies described in Micro-static approaches analyzed the communication patterns in order to discover the expression of autonomy or individuality. Interpersonal conflicts are a threat to existing goals, needs and expectations. To the extent that goals and concerns are linked to commitments, they

are expressions of someone's identity. The link between types of goals and commitments, however, varies between persons. For instance, blocking a person's goal to take a glass of lemonade out of the fridge is likely to result in a conflict relating to the first person's frustrated wish to quench his thirst. This of course, has very little relationship to identity. On the other hand, challenging a person's rightful authority by disobeying is likely to result in a conflict that closely touches the first person's identity as an authority figure. Another example concerns conflicts that involve aspects of humiliation (abasement, degradation, etc.), which are almost by definition closely related to issues of identity. To continue on the first example, for some, but probably not for most, people the blocking of a person's goal to take a glass of lemonade out of the fridge might involve an identity related conflict, eliciting a feeling of being frustrated in one's autonomy or the right to do as the person wants. People may differ among one another in the degree to which they experience any conflict whatsoever as a conflict involving their autonomy and identity (see for a similar argument, Jones, 2001). Similarly, over the life-span there may be changes in the extent to which any arbitrary conflict is perceived as touching one's identity or autonomy.

This is exactly what we can observe during adolescence. Adolescents might easily feel their autonomy threatened in any type of conflict with their parents. In this respect, the work of Smetana (1989, 1995; see also Smetana & Asquith, 1994; Smetana, Crean, & Campione-Barr, 2005) and Collins (1991, 1995; Collins & Luebker, 1994) is very important in distinguishing between parental and adolescent's expectations and perspectives on conflict. Depending on the domain, adolescents often perceive conflicts as a threat to their personal freedom of choice, whereas parents often frame conflicts in terms of violations of existing norms and values. Adolescents' appeals to personal jurisdiction represent their attempts at defining an autonomous self, individuate from parents and increase their agency. Parents' appeal to social conventions, in contrast, serves a socializing function in adolescent development. This conflict between adolescents' appeal to personal jurisdiction and parent's appeal to social conventions entails the renegotiation of the boundaries between parental authority and individual authority of the adolescent (Smetana, 1995). In this sense conflicts serve the development of autonomy in adolescents and force parents to reevaluate the limits of their authority.

If goals, expectancies, commitments or other aspects of identity are violated and threatened, certain emotions and appraisals will arise. Emotions and appraisals touch the unconscious elements of identity. Haviland and Kahlbaugh (1993) have suggested that emotions are the glue of identity; "...that is, identity issues are associated within a differentiated network of many different emotions" (Haviland, Davidson, Ruetsch, & Lancelot, 1994, p. 504). During a conflict, an aspect of a person's identity, e.g. commitment, might be consciously or unconsciously threatened. Since commitments are defined as a person's life choices, it implies that the person attaches importance, relevance and value to them. A threat to these basic concerns will lead to an emotional reaction and appraisal, which can be used as indicator of someone's expression of identity (see for an elaborate discussion of the link between emotions and identity the book *Identity and Emotions* edited by Bosma & Kunnen, 2001a). Emotional reactions and appraisals can be covered by what Erikson said about the different levels of identity formation: it is a process taking place on all levels of mental functioning (Erikson, 1968). Highly relevant in this respect is the work of Frijda (1986, 2001; also Frijda, Kuipers, Terschure, 1989). He states that "emotions involve states of action readiness elicited by events appraised as emotionally relevant; different states of action readiness are elicited by differing appraisals. Events are appraised as emotionally relevant when they appear to favor or harm the individual's concerns: his or her major goals..." (Frijda, Kuipers, & Terschure, 1989, p. 213). Also the work of Roseman and colleagues (Roseman & Evdokas, 2004; Roseman, Wiest, & Swartz, 1994) provides important insights into the relation between discrete emotions (like fear, sadness, frustration, anger, guilt and shame), distinctive goals, action tendencies, and thoughts (see also Fischer, Shaver, & Carnochan, 1990). Lerner and Keltner (2000) investigated the link between different negative emotions (anger and fear) and their influence on judgment and choice. Anger and fear greatly differed on appraisals of control (high in the case of anger and low in the case of fear), uncertainty (high in the case of anger and low in the case of fear) and on assessments of risks. Fear was related to greater risk assessments and anger was related to lower risk assessments. Translated to the context of parent-adolescent conflicts this means that we would expect very different appraisal and behavior patterns in the case of a "fearful" adolescent, compared to an "angry" adolescent. An angry adolescent might fight for his need for

autonomy, because he feels his control is at stake, whereas a fearful adolescent might withdraw from the conflict situation.

Dynamics of micro level identity expressions

As we have outlined above, the expression of identity and autonomy can be observed in the goals and expectancies but also in the emotions and appraisals involved in conflicts between parents and adolescents. The next important question that follows is: How can we study these micro level expressions in a dynamical way? A dynamic approach focuses on the time evolution process of these (inter-linked) variables, e.g. goals, emotions and thoughts. In the case of mother–adolescent (conflict) interactions, a dynamic approach would take the form of a sequential analysis of the behaviors of adolescent and mother. How are mother and child acting and reacting upon each other in the course of time? Similar to the model of [Kunnen and Bosma \(2000\)](#) or [Vleioras et al. \(2007\)](#), we are interested in the iterative process of conflicts. The outcome of one conflict is taken as the input for the next conflict.

In the case of the [Penington study \(2004\)](#), the daughters might initially react to the increased closeness of their mothers by saying “no Mum, this is not your business! Give me some privacy!” In the long run however some of them might discover that by increasing their connectedness and telling their mothers what they do and with whom, they will also increase their possibilities to act autonomously and independently. Mothers on the other hand, are willing to increase their autonomy granting behavior because they feel connected and they know the secrets of their daughters. Based on positive experiences, mothers will discover that the adolescent can responsively deal with the freedom. This means that autonomy and connectedness are not two absolute properties. They vary and change according to previous interactions (e.g. my daughter returned home on time when I allowed her to stay out late), changing goals and concerns (e.g. being close with my mother, telling her what I do makes that I can stay out longer) and temporal contextual constraints (this can be everything from having a bad day, to involvement of a sibling in a discussion).

The same is true for emotional and cognitive patterns. In the long run emotions and thoughts become associated, which leads to a characteristic tendency to appraise situations and events, e.g. conflict situations. Take for instance the identity styles of [Berzonsky \(1990\)](#). They represent tendencies of people in how to deal with self-relevant information. But they are not innate properties. It is likely that they crystallize in the course of development, based on a lot of self-threatening or supporting real-time encounters. The accompanying emotions and thoughts become associated across occasions, and this process leads to a “preferred” strategy to cope with these situations. The importance and influence of previous interactions, on subsequent events, can also be seen in anticipating expectancies. That anticipating expectancies are very basic properties of behavior is demonstrated with the classic experiments of Ivan Pavlov. He has shown that the dog begins to salivate as soon as he hears the bell, because the dog has developed an associative link between meal and bell. As soon as he hears the bell he thinks about food and begins to prepare himself for the food (see the contingency principle in instrumental learning and the phenomena of learned helplessness; in [Leahey & Harris, 1996](#)). Translated to the parent–adolescent context this can take the following form. Suppose we have a mother–adolescent dyad that has been fighting for a long-time about going out. There is a party again, the girl wants to go to but she already “knows” that her mother will not allow her to go. Thus, the girl has the expectancy that her mother will block her goal and she prepares herself for the conflict with an angry face asking for her request in a not very constructive way. The mother on the other hand sees the angry face, knows what is coming next and puts on an angry face herself. The result: the two are in the middle of a fight within less than 30 s. The interaction could take a very different route if it were the first time that the girl asked for permission to stay out late (she has not formed any anticipating expectancies yet) or if the dyad had positive anticipating expectancies (the girl knows from past experiences that her mother is willing to listen to her and eventually give permission). In this sense, past experiences create certain expectancy patterns, which influence present interactions (see also the work of [Collins, 1995](#)).

In sum, the theories and research discussed in this section are examples of ways to approach the micro level expressions of identity in a dynamical manner. We have argued that adolescent–parent

conflicts are an important natural context to study the micro level expressions of identity. Within conflicts identity can be observed within the underlying goals, expectancies, and the accompanying emotions, thoughts and action tendencies. In the second paragraph we proposed ideas how to study these micro level expression in a dynamic way. Here, we suggested to focus on the sequential patterning of conflicts across time, paying attention to the influence of expectancies on subsequent conflicts. Furthermore we addressed the coupling of emotions, behaviors and thoughts in understanding the emergence of certain macroscopic structure, e.g. identity styles or identity statuses. Following our line of reasoning, a possible hypothesis is that adolescents who are often fearful in the relationship with their parents should tend to withdraw from conflicts aimed at gaining space for identity exploration. Therefore, they might have a higher probability to develop a foreclosed identity status. An angry adolescent who wins his freedom to explore should consequently develop his own beliefs and ideas and should therefore be more likely to develop an achieved identity status.

After having proposed ideas about how the micro-dynamic quadrant of the framework could be filled, the last important question we want to address is: How do the two dimensions of the proposed conceptual framework relate to each other? In the next section we will present a theoretical perspective that allows us to integrate the information coming from different quadrants of the framework.

Integration: a dynamic systems perspective—from micro to macro and dynamic to static

In this section we will attempt to answer the question of how the two dimensions of our conceptual framework relate to each other on the basis of dynamic systems theory. After introducing the basic ideas of dynamic systems theory that we find relevant for the domain of identity development, we will deal with the question of the relationship between the different quadrants of our framework. The first part of this section deals with the question of how the micro level contributes to the emergence of macroscopic identity patterns and how these patterns restrict the micro level processes of identity. The second part of this section concerns the question of how results derived from static approaches relate to results based on dynamic approaches. In other words, the critical question is whether we are still talking about the same phenomena and how the information from the different quadrants can be brought together. In addition we will present an explicit dynamic systems model that simulates the development of autonomy and connectedness. We will illustrate different possible trajectories and explain how such a model can be used to relate the four quadrants of the framework.

Identity as a self-organizing, emergent entity with self-maintaining properties: from micro to macro

From a dynamic systems perspective, identity can be seen as an order parameter (in Haken's sense of synergetics, 1977, 1990, 1992, 1999; see also Haken & Stadler, 1990) that emerges out of micro (or real-time) interactions between organism and environment (Bosma & Kunnen, 2001a, 2001b; Lewis, 1995, 1997, 2000a, 2000b; Lewis & Ferrari, 2001; Van Geert & Steenbeek, 2005; Smith, 2005; Thelen & Smith, 1994). An order parameter is a parameter, dimension or variable that specifies a specific macroscopic order, pattern, structure or regularity of the micro-components of a system. In the case of identity the micro-components are real-time actions, interactions with other persons, emotions and emotional expressions, thoughts, verbal communications, etc. (see Micro-static approaches, Micro-dynamic approaches and Filling the micro-dynamic quadrant). The macroscopic structure or order refers to a more or less stable pattern in the way in which these micro-components express a certain "'self-sameness' and continuity through changes and movements across time and space" as we specified in our working definition of identity.

A central point of dynamic systems theory is that it explains this macroscopic order, structure or pattern as spontaneously emerging from the collective short-term behavior of all the micro-components, i.e. as a self-organizing property (see Fig. 2).

The tacit assumption in mainstream psychology is that there exists a dedicated component or central executive structure, like identity that imposes the pattern on the micro-components. In this sense, macroscopic properties are often seen as true essentials, as the isolated and internal cause of the measures (see for a discussion Van Geert, 2002). Though they are not an internal cause of these processes,

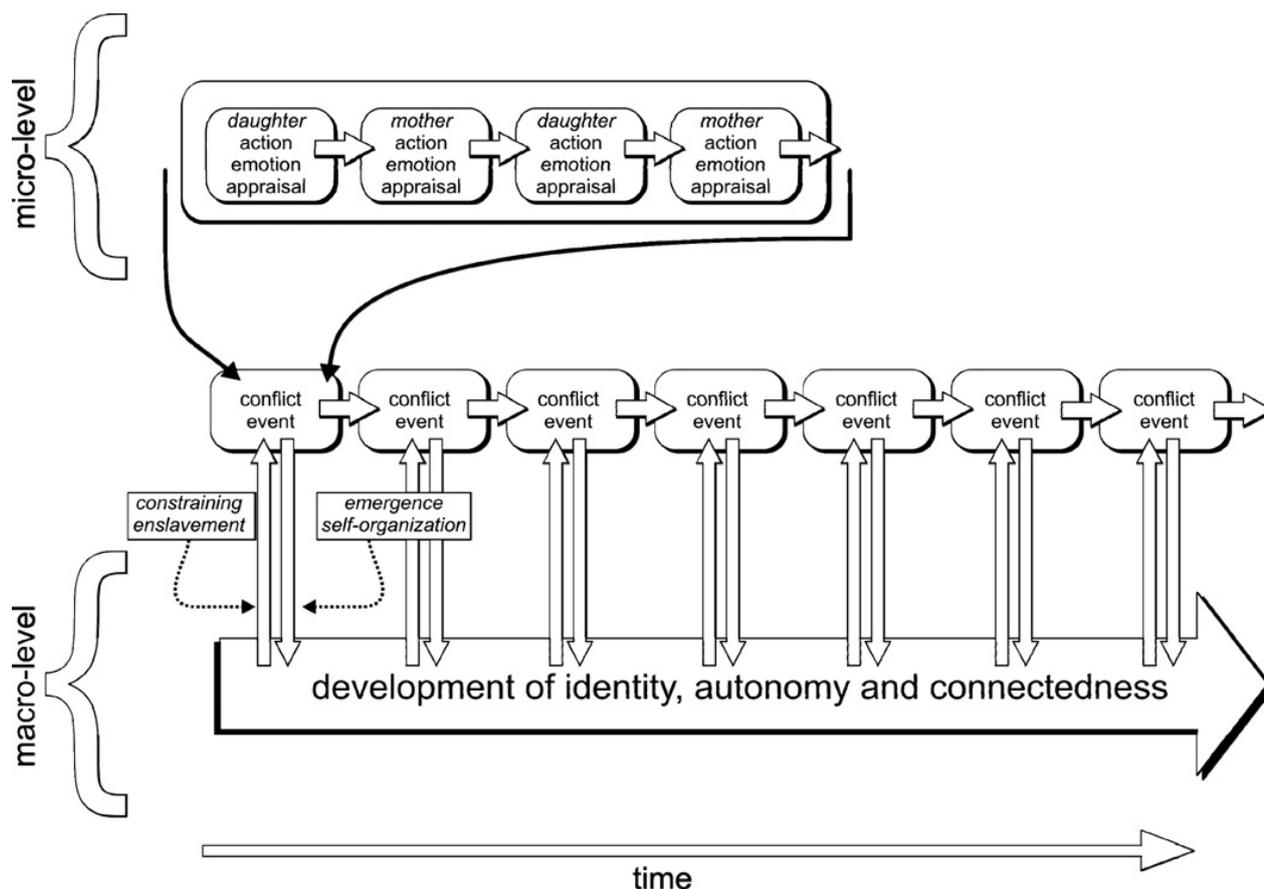


Fig. 2. Identity as an order parameter on the macro level emerging out of micro level interactions.

macroscopic properties do exert their influence on the micro level processes. The influence is, however, more like a determination of the conditions under which the micro-components are allowed to operate. The order parameter enslaves and constrains the micro level processes by reducing the degrees of freedom of the micro-processes, i.e. by reducing the conditions under which they can operate and emerge (Haken, 1999; Haken & Knyazeva, 2000). This is what Haken calls the principle of circular causality: "...the individual parts of a system generate the order parameters that in turn determine the behavior of the individual parts" (Haken & Knyazeva, 2000, p. 59).

But how exactly, then, do the macroscopic order parameters of identity influence the micro-dynamic aspects of identity? The way in which Lewis (1995, 1997, 2000b; Lewis & Ferrari, 2001) developed a model of self-organization in personality development, can be used as a guideline for answering the question of the link between micro level processes and macro level structures. We will briefly discuss the basic ideas of Lewis' model but we will refer to examples of identity research in order to make the link with identity development explicit. Lewis uses the metaphor of a state space or landscape to describe the personality structure in developmental time, and emotional interpretations in real-time. In developmental time "... personality attractors can be defined as the familiar, predictable states people exhibit in their social and emotional behavior" (Lewis, 1997, p. 44). In the case of identity, attractors in developmental time could be the identity statuses of Marcia or the identity styles of Berzonsky. They can be conceived of as attractors because people evolve into one of the four different identity statuses from different points of departure. Once a person is "in" the attractor, e.g. has a certain identity status, behavior will be pulled into the attractor, which creates a self-sustaining energy around that identity status. In real-time attractors consist of certain emotion and cognitive patterns, called emotional interpretations. Lewis specifies two important processes, i.e. feedback and coupling that can explain the crystallization and consolidation of attractors in real and developmental time. Recursive feedback loops between cognitive and emotional activity create a self-enhancing emotional interpretation of a particular situation (Lewis, 1997). The cognitive and emotional subsystems

are continuously “communicating” with each other and emotional interpretations become stabilized through the emergence of coherence in the two subsystems. The cooperation between the different subsystems is called coupling “. . . or mutual selection and co-variation, among independent subsystems” (Lewis, 1997, p. 48; see for comparable ideas within the context of therapeutic processes Tschacher & Grawe, 1996). In order to translate this theory to the case of identity development, think about the examples we gave in Micro level expressions of identity. During a conflict certain aspects of identity are being touched or threatened, which leads to the rise of specific emotions and appraisals. An emotion like anger will be coupled with different cognitions (think about the perception of control), compared to the emotion of fear. In the long run a certain pattern of fearfulness combined with the feeling of no control may emerge, and this pattern will exert its influence on the perception of subsequent identity conflicts. The adolescent will eventually give up fighting for his autonomy and take over his parents ideas and values (see also Strayer, 2002 for possible hypotheses concerning the link between emotional profiles and the identity statuses).

The consolidated macro structure influences subsequent interactions and experiences, by constraining the interaction and coupling of micro level emotional and cognitive elements. The macro structure–personality–narrows the system’s possibilities and options (reduction of the degrees of freedom), making the occurrence of certain patterns or paths more likely than others. Think again about the identity styles of Berzonsky. A person with the information-oriented style will probably seek situations where he or she can verify his self-identity. Someone with a normative-orientation will probably avoid situations that can threaten his self-identity. By avoiding self-threatening situations a reconstruction of the person’s identity becomes less necessary and that person will therefore be likely to remain within the normative style or a foreclosed identity. Another example is a study done by Slugoski, Marcia, and Koopman (1984). The aim of the study was to show how the macroscopic structure of identity status influences the micro level of social interactions (behavioral indices were for instance showing solidarity, asking for opinion). The study showed that individuals falling in the four different identity statuses differed indeed in terms of their social-interactional style. Thus, “having” a certain identity status means that there are constraints at work on how one behaves in social interactions. This process of enslavement creates stability and predictability in developmental time, e.g. the identity statuses. But there is also flexibility and variation in developmental time and even more pronounced in real-time. In addition to top-down processes (macroscopic patterns constrain the operation of the micro level components) there are bottom-up processes operating (micro level interactions influence the macro level structure). Take again the study of Slugoski et al. (1984). In addition to the constraining effects of the identity status, the authors found significant effects of the group composition. This shows that identity statuses are not like little engines controlling people’s behavior. The social behavior of the participants was also strongly determined by their interaction context (the other interaction partners). Also the authors note that “. . . the group effects further necessitate consideration of identity status performance in relative rather than absolute terms” (Slugoski et al., 1984, p. 653). The question is of course whether these small micro interactions have the power to change people’s identity status. It is unlikely that such changes are brought about on the basis of one single interaction: it needs a number of micro interactions before the consolidated structure changes. A good example of this mechanism is described in the model of Kunnen and Bosma (2000), which has been discussed in Macro-dynamic approaches. In order to observe bottom-up influences on identity, one can also look for stronger forces like for instance a great contextual change or perturbation. A perturbation will lead to a disturbance of the existing structures and therefore trigger a transformation process of the existing structures. Examples of perturbations of the identity structure could be major life events, like loss of a loved one or winning the lottery that shakes a person’s feeling of self. Or take changes within the person, like a person’s maturation of secondary gender characteristics that at some point in development tips of the person’s perception of his or her own body, which will eventually lead to transformations in his or her identity.

Inter- and intra-individual aspects: from dynamic to static

In the static-dynamic dimension we introduced the second dimension of our conceptual framework which comprises the difference between static and dynamic approaches. In static approaches

where the focus lies on the structural relationship between variables, sample-oriented research approaches with a large N that eliminates random variation might be the best way to proceed. This differs, however, from dynamic approaches where the focus lies on the evolution of a system, i.e. describing how one state of the system evolves into another state of the system over time. Here, the explanatory target lies in the understanding of the mechanism of change that is an understanding of the time evolution of the system (e.g. changes and stability within the system's states). Consequently, the use of time-serial-oriented research will be preferred. We also discussed the problem of non-ergodicity in developmental processes and the consequences for possible generalizations across the quadrants of the framework (see Problems and pitfalls in existing research). The difference between static and dynamic approaches is closely related to, but not identical with the difference between inter-individual variability and intra-individual variability. Inter-individual variability usually relates to the difference between independent persons at some point in time, and thus to the distribution of properties across samples. Intra-individual differences, on the other hand, relate to the variability in one person (or system) at various points in time, and are thus indicators of the ongoing process, i.e. the time evolution of a system.²

Hamaker et al. (2005) distinguish between top-down generalizations (making inferences about an individual based on results of a population sample) and bottom-up generalizations (making inferences about the population based on individual results) in psychological research. In Problems and pitfalls in existing research we have discussed pitfalls in existing research. A top-down generalization is just this kind of pitfall; static results are going to be generalized to the individual realm. An identity aspect distributed across age is generalized to the time evolution process of identity at an individual level. Hamaker et al. (2005) suggest that the strong reliance on top-down generalizations within psychological research might stem from the desire to establish general laws, laws that apply to all members of a population. "However, what holds collectively is not necessarily identical to what holds in general" (Hamaker et al., 2005, p. 210). A valid top-down generalization can only be made under conditions of homology across levels (or if the criterion of ergodicity is met). This means that the intra-individual relationships (e.g. intra-individual correlations or factor structure) are similar to the inter-individual relationships (e.g. inter-individual correlation or factor structure). Accordingly, the first important step in order to validly generalize is to investigate whether the condition of homology across levels is met. However, it is highly likely that homology is the exception rather than the rule. Consequently, Hamaker et al. (2005) strongly advocate the use of individual time series analyses (e.g. multivariate stationary time series analyses) in order to investigate the structure of variation at the intra-individual level and compare this with the inter-individual structure or variation. Only combined intra-individual time serial data can reveal whether there exists a general law or mechanism that holds for all individuals within the population.

The consequence of this argument is that in order to study and eventually understand processes and development—instead of inter-individual differences—we have to discover the general dynamic laws. The dynamic laws of a process can only be dismantled with the use of many combined individual time serial analyses, carried out over a great number of separate studies (Hamaker et al., 2005; Moleenaar, 2004; Van Geert & Lichtwarck-Aschoff, 2005). Detailed observations of single cases allow for generalizations about process characteristics; that is the general laws, dynamics and mechanisms of a process (see for an example of language development Van Geert & Van Dijk, 2002; or behavioral assessment Shapiro & Kratochwill, 2000). In the case of identity development this means that we need a lot of individual time serial studies of individual identity trajectories. Comparing these individual trajectories should reveal whether and to what degree these trajectories are identical. Similarities across the trajectories point to the existence of general laws and mechanisms of change. Differences across trajectories mean that the processes are not uniform and we have to search for alternatives in order to compare individuals, such as focusing on: subpopulations, the difference in the amount of in-

² It is important to note that this combination (static-inter and dynamic-intra) does not hold for all kind of analyses. We already discussed the use of latent growth curve analyses, which are based on an analysis of inter-individual variation and yet explicitly include dynamic aspects and relationships. Moreover inter-individual differences can also be explained by a dynamic approach if the individuals interact and thus are forming a real dynamic system, e.g. as described by agent models.

tra-individual variation, or the difference in complexity of the intra-individual structure (Hamaker et al., 2005).

Another fruitful approach to discover general laws and mechanisms of the developmental process are dynamic systems models and simulation techniques (Cook et al., 1995; Felmlee & Greenberg, 1999; Gottman, Swanson, & Murray, 1999; Gottman et al., 2002b; Kunnen & Bosma, 2000; Schiepek, 2003; Thelen & Smith, 1994; Van Geert, 1994, 1998, 2003; Vleioras et al., 2007). In order to build a dynamic systems model, one has to specify the relevant building blocks or parameters, and specify their relationships and influence processes in a way that captures the essential dynamics of the process (see for more elaborate description Van Geert, 1994, 1998, 2003). The parameters can be everything the researcher thinks is relevant for the process under study. In the case of identity development it could be biological factors, temperament, family factors or environmental constraints. Building a dynamic systems model of identity means to formally specify the relevant mechanism(s) of change on the basis of general, theoretically grounded principles of change (Van Geert, 1998, 2000). Thus, there is a set of general laws or mechanisms that describes how the parameters operate and interact with one another.

In the next section, we will present a mathematical model that describes the long-term development of autonomy and connectedness based on the dynamic approach of our conceptual framework. The model should be viewed as an illustration of how existing knowledge and theory can be translated into a dynamic system model that explicates the underlying mechanism(s). Simulations will serve as an illustration of different—theoretically plausible—developmental trajectories. On the basis of this model we will demonstrate how a dynamic systems model and simulations thereof fits all the four quadrants of the proposed conceptual framework and how it can be used to integrate them.

A model of connected growers for the development of autonomy and connectedness

In the role of autonomy/individuality and connectedness within the process of identity exploration, we have argued that the striving for autonomy can be interpreted as a precursor of identity development, aimed at creating a self-determined space for identity exploration. The specific challenge during adolescence is to overcome the childlike form of connectedness and dependency between parents and child and to evolve into a more independent and autonomous relationship style where one still feels connected and attached (see for the relevant literature The role of autonomy/individuality and connectedness within the process of identity exploration). Thus, it is a qualitative change of the connectedness; connectedness gets richer, deeper, more mature and realistic when it originates from a growing autonomy. A successful renegotiation process during adolescence and eventually the development of a harmonious equilibrium between autonomy and connectedness with parents would be the ideal trajectory and will help the growing adolescent to develop an autonomous self and face later relationship challenges.

Based on these theoretical ideas we developed a mathematical model for the long-term development of autonomy and connectedness.³ The evolution term of the model, specifying the mechanism of change, is explicitly based on a model of the short-term mechanisms operating on the micro level. With regard to the initial level of the model, we assume, for simplicity, that connectedness starts with a medium level and autonomy with a low level. In a psychological sense this means that connectedness is present but at a developmentally less sophisticated level (based on attachment, un-reflected connectedness, idealized view of parents; see also Vleioras et al., 2007). Autonomy on the other hand has yet to develop. At the onset of puberty, the autonomy striving of the adolescent begins to increase, due to a number of child-related, parental and contextual changes and transformations. It is important to note that autonomy and connectedness as we use them here in the model refer to perceived properties, in the sense that they are experienced and apprehended by the person himself. The basic hypothesis of the present model is that autonomy is mainly attained through conflict events, quarrels and fights over autonomy issues (Smetana, 1995; Vuchinich et al., 1996). These conflicts have a temporary negative ef-

³ Note that autonomy and connectedness as we use it here can also be replaced by similar concepts such as individuality and connectedness (Grotevant & Cooper, 1985, 1986), separateness and connectedness (Hess & Handel in Penington, 2004), or distance and closeness (Kantor & Lehr, 1975). The basic idea is that of a dialectic relationship between two forces.

fect on the level of the perceived connectedness; i.e. they lead to temporary separation, or more precisely, feelings of separation, difference and opposition (see for instance [Pinquart & Silbereisen, 2002](#)). In this way we can model how the micro-interactions, i.e. the conflict interactions influence the development of autonomy and connectedness.

Besides this short-term mechanism, the model also contains a long-term influence between autonomy and connectedness. The relationship between autonomy and connectedness is described by a logistic model of connected growers ([Fischer, 1980; Van Geert, 1994](#)). Both growers (i.e. the variables that undergo a process of change) depend on the existence of a set of resources in the environment of the adolescent (e.g. peer relationships that allow adolescents to experiment with autonomous behavior or encourage autonomy strivings). The existence of resources influences the individual change rate of each grower and the maximum attainable level, which is called the carrying capacity. In the model this is described by a term in the equation that subtracts the current level of a grower from its maximum, which is a simple linear function of all the resources available. The more closely the level of the grower approaches the maximum, the smaller that value and therefore the smaller the growth. For simplicity, the carrying capacity, i.e. a grower's maximum level is normalized to 1 (see for a more elaborate discussion [Van Geert, 1994](#)).

In addition, autonomy and connectedness (i.e. the growers) are influencing each other's change over time, i.e. one grower depends on an influence parameter of the other grower, and the other way round. Thus, in an optimal situation the development of autonomy and connectedness profit from each other in the long run because they have a mutual positive relationship, leading to an equilibrium between autonomy and a mature form of connectedness.

In the model the long-term change of autonomy, i.e. the change in autonomy (ΔA) given a certain amount of change in time (Δt), is described by the following equation (note that autonomy is denoted with an A and connectedness is indicated with a C):

$$\Delta A/\Delta t = A * \text{change parameter}_A * (1 - A) + \text{influence}_{C_{\text{on}}A} * A * C \quad (1)$$

As one can see in the equation, the growth of autonomy depends on the one hand on the autonomy level already attained, on its individual change rate parameter which is a constant factor of proportionality (see [Van Geert \(1991\)](#); compare it also with the notion of “inertia” used by [Gottman et al., 2002a, 2002b](#)), and the distance between the current growth level and the carrying capacity, which has been normalized to 1. In addition the growth of autonomy is directly affected by connectedness, which can be seen in the second part of the equation. In the stochastic version of the model, the effect of connectedness on autonomy is modeled as a normal distribution of influences, with a mean that can be either negative, zero or positive. If it is negative, the level of connectedness has a negative influence on autonomy, i.e. tends to reduce it. If the mean is positive, connectedness—on average—supports autonomy, i.e. leads to positive increase. At each time point, a random influence factor is drawn from the distribution, i.e. the effects are random within each trajectory. By modeling the relationship by means of a randomized influence, we can model the real situation in which both tendencies exist—support and suppression of autonomy—but with an average which is either positive or negative.⁴ Simulations of the model with different parameter values result in different developmental trajectories (see the simulation examples below).

The development of connectedness is also based on a logistic growth function. In contrast to Eq. (1) this equation contains three components:

$$\Delta C/\Delta t = C * \text{change parameter}_C * (1 - C) + (-p) * C * \Delta A/\Delta t + \text{influence}_{A_{\text{on}}C} * C * A \quad (2)$$

The first part of the equation is similar to the first equation; the growth of connectedness depends on the connectedness level already attained, on its individual change rate parameter and the distance between the current growth level and the carrying capacity, which is set to 1. Next, there is the short-term influence of the model (second part of the equation). This mechanism describes the temporary suppression effect of autonomy on connectedness, which is due to the fact that increase in autonomy is assumed to depend on conflict-laden interactions, which tend to temporarily reduce the perceived

⁴ By setting the standard deviation of the stochastic parameters to 0, the model is changed into a deterministic model, with the mean of the parameter taking the desired value of the parameter at issue.

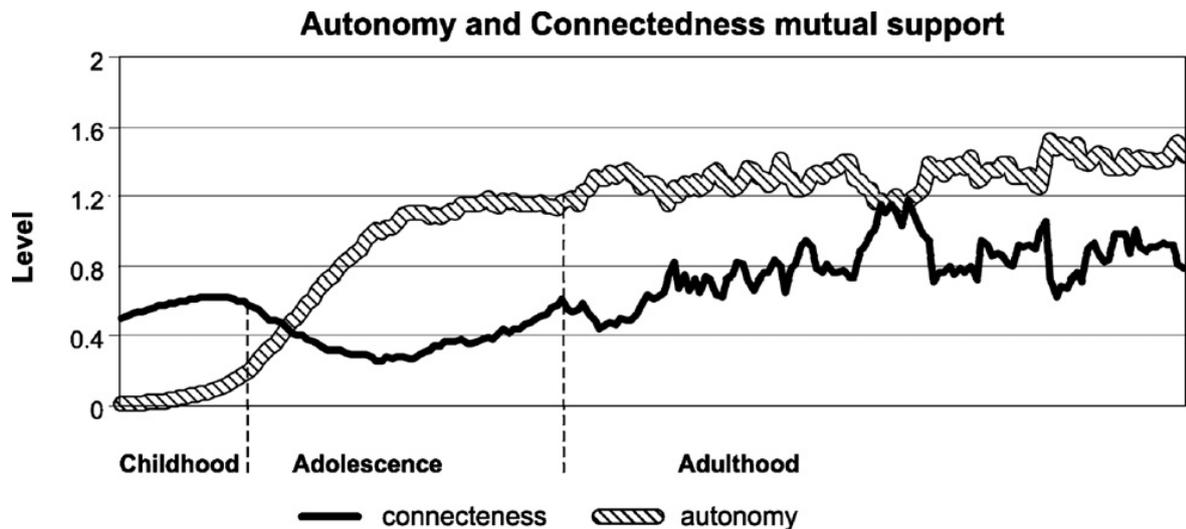


Fig. 3. The result of the model simulation based on a mutual supportive relationship between autonomy and connectedness.

connectedness of the participants. Mathematically speaking, autonomy affects connectedness negatively by change, i.e. there is a negative effect of the first derivative of autonomy on connectedness, which is denoted by a negative value of the interaction parameter p .⁵ Finally, similar to Eq. (1), there is the long-term influence of autonomy on connectedness. Again, the effect of autonomy on connectedness is modeled as a normal distribution of influences in the current model. This means that the values can be either negative, zero or positive, denoting the kind of relationship between autonomy and connectedness (i.e. competitive versus supportive). Again, in each step of the simulation, a random influence factor is drawn from the distribution. In the case of an optimal development increasing levels of autonomy of the adolescent will lead to an increase in connectedness, in the sense that the quality or the maturity of the connectedness increases.

In sum, this model of connected growers can be used to describe different developmental trajectories, ranging from healthy developments to more problematic situations. For illustrative purposes we will discuss three different situations. It is important to keep in mind that the core of the short-term model of conflict interactions remains the same, i.e. the autonomy striving expressed in the increased levels of conflicts during the period of adolescence leads to a temporary decrease in parental connectedness. Based on this assumption the short-term influence is kept to a negative value (see Eq. (1)) and we only change the other two influence parameters (i.e. $\text{influence}_{C_on_A}$ and $\text{influence}_{A_on_C}$). Fig. 3 describes healthy family relationships in which a supportive interaction between the levels of connectedness and autonomy exists, that is, both influence parameters are positive (family relationships exhibiting individuation, Grotevant & Cooper, 1985, 1986; or authoritative parenting). The graph (see Fig. 3) shows a temporary decrease in connectedness around adolescence, followed by a steady increase of both autonomy and connectedness until both stabilize around a certain maximum during adulthood.

Second, the model can simulate trajectories in which the growth of autonomy competes with the growth of connectedness (think about the development of deviant youth where the adolescent disconnects from family relations). Here, the effect of autonomy on connectedness is negative (see Fig. 4), which bears several risks for the development and adjustment of the adolescent (think about the potential risks of lacking a social network or a supportive relationship with the parents). As one can see in the graph (see Fig. 4) connectedness disappears during adolescence as a result of the rising autonomy.

The third example finally, models another problematic trajectory, namely a situation in which connectedness has a repressing effect on the autonomy development (think about enmeshed family rela-

⁵ In the current model this effect is represented by a deterministic value. Note that this relationship can also be modeled by a stochastic parameter.

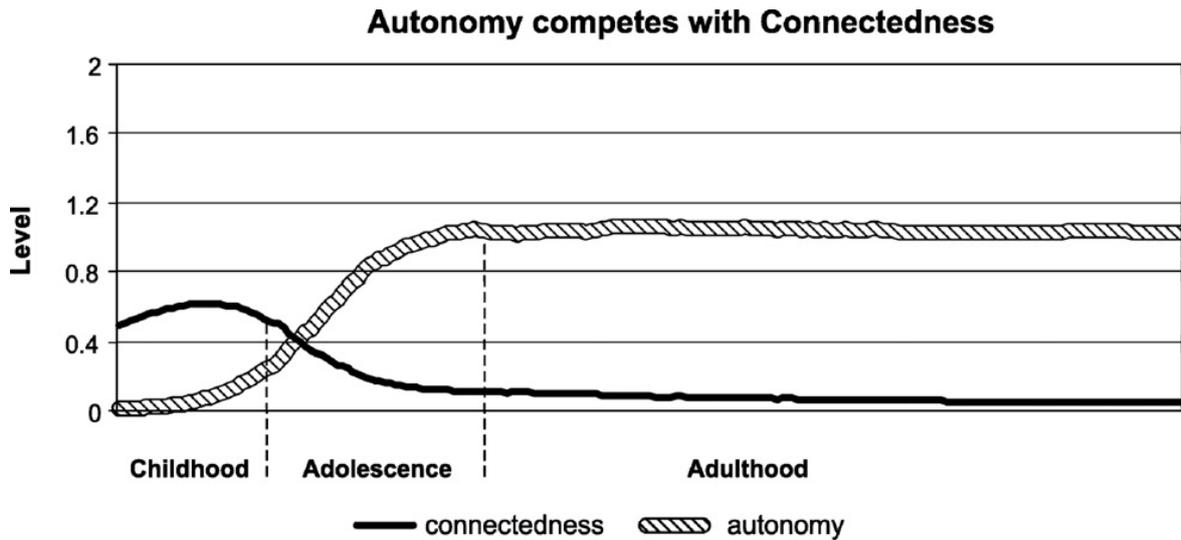


Fig. 4. The result of the model simulation based on a competitive relationship between autonomy and connectedness. In this case the influence of autonomy on connectedness is negative.

tions, authoritarian parenting, or the effect of psychological controlling parents see [Silk, Morris, Kanaya, & Steinberg, 2003](#)). In these situations the effect of connectedness on autonomy receives a negative value (see [Fig. 5](#)). What we see now in the graph (see [Fig. 5](#)) is that connectedness shows only a minor dip during adolescence and that autonomy also rises during adolescence and stabilizes afterward but on a far lower level than in the other scenarios. That means that autonomy remains under the level that could be achieved if all resource factors could be put to full use.

The model within the conceptual space—integrating the four quadrants

The dynamic systems model for the development of autonomy and connectedness as we present it here operates on the macro level of our conceptual framework. That is it describes changes in these entities and the relationship between the two over long-time intervals, i.e. across development. In addition the model also incorporates the micro level, the level where concrete experiences and conflicts are taking place, by means of the evolution term, which is based on the short-term mechanism

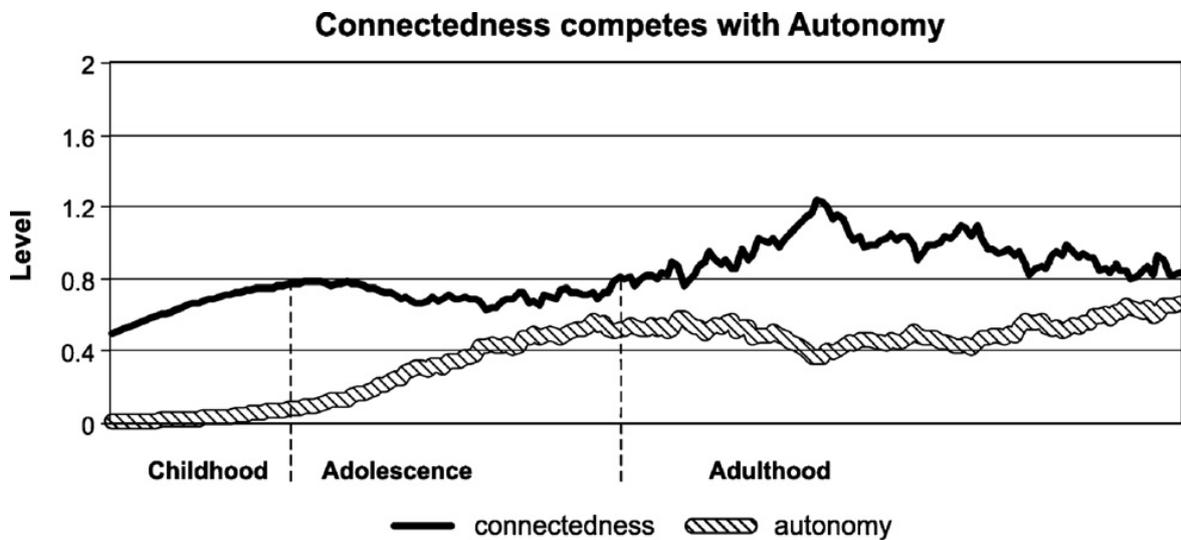


Fig. 5. The result of the model simulation based on a competitive relationship between autonomy and connectedness. In this case the influence of connectedness on autonomy is negative.

(a temporary suppression effect of autonomy on connectedness). Furthermore the model describes the changes in autonomy and connectedness over time on the basis of an iterative mechanism, available resources and a set of influence mechanisms. It is clearly a dynamic approach because it is theoretically grounded on a plausible model of short-term interactions and it applies to the whole time scale of interest, namely the developmental time scale.

Specifying the function of the evolution process does not mean that all individuals will end up at same point. Instead, it is very likely to find great inter-individual differences in the outcome, as we have shown in the three different simulation examples. Differences in the equilibrium between autonomy and connectedness are caused by differences in the parameter values, e.g. the influence parameters, the starting values and the growth rate parameter. At a first glance these parameters may appear as highly abstract concepts but they are not. The parameters in the model stand for well-known, classical concepts in the existing literature, such as parenting behavior, family climate, personality and temperament related factors, friends and peer influences and so on; factors that have been shown to be related to the development of autonomy and connectedness during adolescence. Thus, existing research based on static approaches can very well be used to formulate the dynamic relationship and mechanisms. This again clearly illustrates that all quadrants of the framework serve their specific purposes and that they can complement each other in order to arrive at a full understanding of the phenomena.

We briefly discussed three different developmental trajectories based on simulations of the model with three different configurations of the (influence) parameters. The simulation of the model shows the individual trajectory of a person over time. The three different trajectories are thus representations of three different individual trajectories. In the line of this reasoning it is possible to reproduce all trajectories of all individuals within a population by simulating the model n times, each time with a different parameter configuration (the configuration that belongs to a specific individual in the population). This means that we can view the population as an n -dimensional space of parameter values (the dimensions depend on the amount of parameters) and each individual is represented by a position within that space. The positions of the individuals within the parameter space result in a distribution of parameter values within the population. Also the outcome of the process, based on the dynamic model, can be translated into a distribution by taking a cross-section of all possible trajectories at a certain point of time. This distribution can then be used to specify static relationships. But the important thing is that the distribution is in fact the result of ongoing individual processes.

In a similar vein, but in a different context, Steenbeek and Van Geert built a dynamic systems model of dyadic play interactions (Steenbeek, 2006; Steenbeek & Van Geert, 2005, 2007) that generated testable predictions concerning differences between groups of children of different sociometric statuses. The authors' predictions differed from the ones of static models because their predictions were based on a process model (Steenbeek & Van Geert, 2005). Also the model of Kunnen and Bosma (2000) can be used to generate and test empirical predictions on an intra-individual as well as inter-individual level. Validation of the predictions with empirical data supports the existence of a general dynamic law of identity development. In the case of identity development, and most other psychological processes, it is not possible to predict the outcome on the basis of the initial parameter values. This has to do with the complexity and non-linearity of the interaction of the parameters. Moreover small differences in the starting values can lead to considerable differences in the outcome of the process. Building dynamic systems models offers a solution to this problem because they incorporate the complexity and non-linearity of the process.

Conclusion—directions for future research

It should be clear that a dynamic systems perspective of identity, as it is presented in the last section, is completely different from a view of identity as "... a little engine inside a person's head that generates particular behavior" (Van Geert & Steenbeek, 2005, p. 422) in which identity is defined as an internal and stable, cognitive structure formed during adolescence (Marcia, 1993). Our dynamic systems perspective of identity resembles much more the perception of Erikson (1968, p. 24): "... identity is never 'established' as an 'achievement' in the form of a personality armor, or of anything static and unchange-

able". In our view identity should be seen as "...rooted in emotion, emerging in relationships, and developing as a dynamic, self-organizing system. . ." (Kunnen, Bosma, Van Halen, & Van der Meulen, 2001, p. 5). The major advantage of dynamic systems theory is that it allows us to combine and integrate all the four quadrants of our conceptual framework. Self-organizing processes can explain how micro level processes of identity contribute to the emergence of the macroscopic property identity as well as vice versa. The application of the principle of self-organization to identity, and particularly its origin in the collective behavior of the micro components and not in a presumed central executive component, is a hypothesis that needs to be developed further. Our belief in the hypothesis is not so much based on an understanding of how identity exactly emerges out of the micro interactions as on the observation that self-organization works for and has been demonstrated in a host of natural, especially complex phenomena. We are confident that it will also apply to the complex phenomena of identity.

Our aim was to present a conceptual framework for the study of identity in the context of time that can serve as a basis to organize and compare existing research and spot empty fields within the theoretical space. Applying the framework to existing literature revealed that only the macro-static corner of the framework is well filled, research focusing on micro level aspects of identity and dynamic processes is rather limited. The dynamic systems model for the development of autonomy and connectedness we presented here was based on a combination of research and insights from various quadrants. By doing so, we illustrated how the quadrants of the framework relate to and can complement each other. We started from the literature described under the macro-static quadrant and incorporated a short-term mechanism, based on the assumption that it is the micro level interactions that grow into macro level outcomes. Each step in the model consists of a micro level interaction, i.e. a conflict about autonomy. Thus, what we need is more research that focuses on the short-term dynamics of micro level interactions (i.e. conflicts) around identity issues involving the relationship between autonomy and connectedness.

In Filling the micro-dynamic quadrant we have emphasized the role of emotions, goals and appraisals as ways to operationalize the expression of identity at a micro level and we are confident that dynamic systems oriented approaches provide a fruitful future direction for research. These approaches draw the attention to structural and temporal aspects of the developmental process such as intra-individual variability, trajectories over time and the underlying mechanisms. In terms of the micro-dynamic aspects of the conflict interactions, interesting questions are: How big is the discrepancy between parents' and adolescents' views on autonomy and connectedness? A large discrepancy should increase the likelihood of conflicts and the interaction between both forces. How do certain emotions become organized during conflicts and how do they influence the balance between autonomy and connectedness? Anger might serve the fighting for autonomy (go out and attack the obstacle) but it also bears the risk of getting too rigid and self-defensive, which can on the long run have negative consequences for the development of the self (Magai & McFadden, 1995). Then there is the question of repair and emotional recovery. Is a dyad able to recover from the negative emotions after conflict? This ability probably influences the "ease" with which a new conflict is started. Finally the question of the intra-individual variability of conflict patterns could reveal whether a dyad is getting stuck within a certain conflict pattern. This could lead to stagnation in the growth process of autonomy and connectedness.

We believe that it is time for new research, not more of the same but innovative approaches are needed in order to complement our picture of identity development. A lot of existing theories are formulated in a dynamic sense, thus the challenge is to broaden our view and ask new questions and find methods that suit this dynamic nature. We outlined possible ways to approach identity at a micro level and thereby hope to draw interest to the day-to-day, real-time level of identity development. The micro level is an understudied area but it nevertheless reflects identity just as the macro level does. The difference lies in the nature of the mechanisms behind the events at these different time levels. Finally, we wish to encourage researchers to reconceptualize existing knowledge and theories into dynamic models that capture the nature of developmental processes of identity at interacting time scales.

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