

# Facilitating change in early childhood intervention by using principles from systems theory: An interventionist's perspective

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## ABSTRACT

All interventions have one aspect in common – the pursuit of positive change, ie, moving towards a particular intervention goal. In intervention both sudden changes and long-term changes are necessary – sudden changes act as an incentive to carry on with intervention as the “effect of intervention” is quickly seen, whilst longer term changes are important for maintenance and mastery of particular skills. The purpose of this article is to explore both types of change from a systems theory perspective. Bifurcation points, stabilising central attractors (SCA) and functional and structural linkages are used to explain sudden change, whilst equifinality and self-stabilisation are explained with reference to long-term change. This article concludes by pointing to specific implications for intervention when using systems theory as the framework.

**Key words:** dynamic systems theory, early childhood intervention, general systems theory, long-term change, sudden change

## Introduction

The field of early childhood intervention is based on the premise that things can be changed, managed and controlled through human intervention<sup>1</sup>. Two general categories of intervention have emerged, namely broad based intervention, which is multi-faceted in design and aimed at affecting overall development, and focused interventions that are directed at single developmental domains such as neuromotor development<sup>2</sup>. In this article the term intervention will be used to refer to broad-based interventions aiming at increasing a person's engagement in everyday life situations<sup>3</sup>. Because of the fact that everyday life situations will vary with cultures, countries and age of the person, the desired outcome will also vary to an extent, with country and age of the person. That is, desired outcomes will vary dependent on the system they are defined by and therefore participation should be defined differently, depending partly on the context in which engagement is manifested and partly from its universal characteristics. Universal characteristics of participation are motivation/sense of belonging, goal directed activity and opportunities to act. More focused person, focused outcomes, eg, learning to talk is probably less cultural sensitive and therefore more universal. The focus of this paper is primarily broad based interventions with general outcomes.

All intervention strives for change in a positive direction; “change for the better”. However, it has often been found that sustaining this “change for the better” is unsuccessful when intervention is withdrawn. Why is this phenomenon seen? In this article it will be hypothesised that two important constructs from systems theory, namely change and stability, are frequently overlooked in the field of early childhood intervention. Change is defined as differences in amount or quality in a phenomenon over time. Stability is defined as predictability in a phenomenon over time, thus stability includes both lack of change and predictability of change. The aim of this article is to explore the constructs of change and stability from an interventionist's perspective and to apply them to the field of early childhood intervention.

In early childhood intervention, two basic components are present. The first is participation / involvement and the second directed change. Participation refers to the extent to which each partner takes ownership of the intervention process in order to increase compliance in intervention. Participation is thus seen as a process of social construction of reality, eg, consensus on desired goals for intervention, and the development of meaning rather than as an outcome of the intervention. This is, however,

not the focus of this article. The second component looks at change as a goal directed process, involving the acquisition of skills and different levels of competency as part of the change process. All human beings should thus be viewed as active and motivated organisms that remain engaged in adapting to the challenges of life, inherently accepting order and disorder (change)<sup>4</sup>.

It is very common nowadays to observe multiple interactions between phenomena and to make links between problems, eg, ecological and social problems interact with personal ones<sup>5</sup>. Systems theory in particular provides a framework for looking at the laws of how specific units function when they are dependent on each other through their interrelatedness, thereby providing a foundation for looking upon change. Change, from a systems theory perspective is concerned with change in the relationship between units, and not necessarily the change in the units themselves. When studying change from a systems perspective the focus is thus on situational conditions, ie, change in one part of the system affects other parts of the system, as well as the system as a whole. In intervention this would imply that the interventionist does not become so focused on specific goals to the detriment of seeing the individual holistically. Systems theory also attempts to describe both sudden changes as well as longer term changes. Dynamic systems theory (also known as chaos theory), attempts to explain sudden change as there is sensitivity for initial conditions (butterfly effect). In order to understand change from this point of view, bifurcation points, stabilising central attractors (SCA), functional and structural linkages should be taken into consideration. On the other hand, general systems theory attempts to explain change that occurs over a longer period of time and the important concepts here are equifinality, self-stabilisation and centralisation.

Systems theory is particularly useful as a theoretical framework for looking upon change as it provides opportunities to shift focus between levels of reality, eg, what is good for one child may not be good for the family or for the society. This is a factor frequently overlooked in intervention, as intervention is often focused only on the child. Systems theory also alludes to the emergent properties that appear on a specific systems level, eg, in different contexts different aspects of a child are seen. This is especially true when working with very young children and/or children with severe disabilities who are dependent on routines and well-known activities for optimal functioning. However, it becomes more difficult to understand a system when you are a part of that system,



eg, when providing intervention, you become a part of the system and you influence the way in which the system thinks and reacts. Bourdieu<sup>6</sup> discusses the concept of self-understanding. In some instances one might think that one understands, but when objectively measuring this, a different outcome may be seen, eg, in a specific preschool the teachers made special attempts to treat boys and girls in exactly the same way, but when they made videos and carefully described the interaction, the boys and girls were in fact treated very differently. Systems theory also has intuitive appeal for the early intervention field as it does not focus only on biological factors or only on environmental factors/contextual factors, but rather on the interdependency between them. The individual is seen as an active part of the environment while at the same time the context as a source of information about the individual's behaviour, becomes more important<sup>7</sup>.

### Some important theoretical constructs in describing sudden change

As mentioned previously, the dynamic systems theory is primarily concerned with describing sudden change. Understanding this type of change is important for interventionists, as this might be indicative of periods when the child is most susceptible and absorbent to intervention. When a child is at a bifurcation point, less input from the interventionist is needed at this time to provide a maximum change. Another implication for intervention is that these short-term changes may act as the trigger for intervention. Parents often report that their child's functioning was stagnant despite intervention and that it then suddenly started changing for the better. This sudden change might then increase compliance with intervention as the parents might be motivated by the success that is experienced. Bifurcation points, stabilising central attractors (SCA) and functional and structural linkages and their importance in explaining sudden change will now be explored.

#### Bifurcation points

Bifurcation points refer to qualitative change in the system ie, a dramatic shift in its state. However, it cannot be predicted exactly when the system will change, eg, when bathwater runs out, at some point (the bifurcation point) it starts making a slurping noise. Exactly when this slurping noise will be heard cannot be predicted, only the fact that it will happen. At the particular bifurcation points a system is more sensitive to change, and thus intervention should be focused on these points/times as it will be easier to facilitate the change, optimising intervention outcomes and reducing unnecessary lengthy interventions. Another constraint is that bifurcation points at micro levels cannot predict changes at macro levels. When a system is unable to adjust in any way to external or internal influences by self-stabilisation, it is approaching a bifurcation point. Thus a bifurcation point indicates the end of a stage, but also the start of another. Examples of known bifurcation points are "positive events" such as when a child starts walking, when a child starts talking and "negative events", such as major stress, illness, death, parental divorce or combinations of these stressors. However, dynamic systems theory postulates that bifurcation points need not be major traumas, but could also be small changes in everyday factors at critical times<sup>8</sup>. One specific bifurcation point for a family that has an older child with an intellectual impairment is when the younger child "outgrows" the older one, thereby changing the psychological birth order of the siblings, which may make it very difficult for the family to adapt.

Bourdieu<sup>6</sup> also alluded to a concept similar to bifurcation points, which he termed "*qualitative changes in the system*" which refers to the changes (which might be slight) and predicts that there are certain stages when a system is more sensitive to certain things. However, he doesn't discuss in detail the nature of the change. Similarly, the Vygotskian term "*zone of proximal development*" describes the period of time when the mastery of a specific task is preceded by the period of time when children can only solve the task in collaboration with adults or more competent children<sup>9</sup>. As with bifurcation points, the zone of proximal development is difficult to predict as children of the same age may have different zones of proximal development, and this should also not be confounded with a general developmental level

A factor that should also be addressed is the fact that people (the person system) change more slowly than ecological microsystems (inherent inertia). Human beings have a general tendency to like routine activities and to search for environmental niches with features in which they can

use earlier skills and knowledge, ie, niches matching their competencies. It creates a feeling of security because of increased predictability and self-reinforces areas of competence. As individuals become older, this tendency to look for niches with known features increases and thus inherent inertia also increases. Likewise, inertia is often one of the identifying traits of individuals who function on the autistic spectrum. However, it should constantly be kept in mind that the outcome of intervention is a process, and not a state. An implication for intervention is that intervention based on features of people's existing niches increases the likelihood of intervention success, ie, change. Paradoxically, designing interventions containing positive niche features might also increase the probability that outcomes are sustainable over time, ie, stability.

Four processes acting over time that decrease sensitivity towards sudden change have been described, namely:

- **Buffering:** Positive thing that helps individuals handle negative things. For example, a child with a disability could be placed in an inclusive main stream preschool where positive attitudes towards disability prevail, before entering a main stream primary school where potentially negative attitudes might exist.
- **Steeling:** Little negative things that make individuals handle big negative things later on, more positively. An example of this would be deliberately to take a child whose mother tongue is not English into situations where he is exposed to English and English-speaking friends if it is known that he will need to attend an English medium school the following year.
- **Sensitisation:** Something positive that makes it easy to benefit from something positive later on, or something negative which makes the individual negative towards other things. Often parents with young children who are non-speaking become more positive and sensitive towards their own child when they have the opportunity to interact with a positive non-speaking adult role model.
- **Blunting:** Negative experiences that limit future positive outcomes. A paucity of research into this aspect exists, but it has been found that some families that come to intervention have had so many negative experiences (blunting) of intervention settings that they cannot benefit from positive advice given in a new setting.

As can be seen from the examples above, knowledge of these processes can be used both for proactive interventions (see steeling above) and for explaining people's reactions in an intervention setting (see blunting above).

#### Stabilising Central Attractor (SCA)

SCA refers to the things that an individual's life turns around, in other words things that are of particular importance for the individual or the individual's functioning. SCA can also be seen as the things that pull a system in a particular direction, or that make something behave in a particular way on its way to a goal<sup>10</sup>. SCA develops through a process of repetitions (of experiences) that gradually form stronger linkages between the person and the environment. SCAs are linked to niches in the manner that people develop niches that fit with their SCAs. The presence of stabilising central attractors can be used effectively in intervention. For example, when a child comes for an assessment for the first time the interventionist has to look at activities and interests with which the child feel safe and comfortable, eg, if a child is focused on building with LEGO and other blocks, he will not be interested in people, but will focus on "construction" activities. The interventionist can then start with the construction activities that the child is already interested in and active with and expand from there, so that the change can happen from a safe, comfortable place. On the other hand, the presence of SCAs can make intervention more difficult. If for example, a child has frequent temper tantrums, the activities of the family might be focused on avoiding temper tantrums in all available niches rather than providing the child with models for alternative communication use. This might lead to families who do not adhere to planned communication interventions. Different influences can act as an SCA. This would include biological influences (eg, chronic illness, physical or mental disabilities), psychological influences (nature of early attachment, culturally-based values) and social influences (economic depression).

Certain conditions can change the trajectory of an SCA and these are referred to in the chaos literature as *perturbations*. Thelen<sup>9</sup> suggested that deep sleep is a SCA for new born infants and attempts



to waken them produce only a temporary stirring. As a strong SCA, deep sleep is resistant to perturbations, such as mild movement, the caregiver's voice, light and noise, and the system is likely to return to its original state. Drowsiness, however, is a weak (or less stable) attractor, and a perturbation will more easily coax the infant into another state, eg, wakefulness. The implications of this are that intervention (perturbations) will be more successful if administered during transitions between strong attractors when the system is less stable and more open to change. In their work, Guess and Sailor<sup>11</sup> found that stereotypic behaviours are potentially strong SCAs, which are often highly resistant to most perturbations (eg, environmentally induced intervention). Stereotypical behaviour is commonly observed to be initiated when the child either is becoming drowsy (weak attractor) and uses stereotypic behaviour to regulate bio-behavioural state towards fully awake or becomes agitated (weak attractor) and uses stereotypical behaviour to calm down. Thus, stereotypical behaviour is most easily affected in the transition periods between states, but is difficult to stop once it has been going for awhile.

### Functional and structural linkages

Functional linkages<sup>12</sup> refer to unrelated influences that do not occur together with more than chance probability but when they do occur together they combine to influence a certain development or functioning, eg, both functional peer relationships and availability of assistive technology for communication can lead to higher levels of peer interaction. The two influences are independent of each other and thus must be the focus of separate interventions. Structural linkages refer to where two or more developmental influences co-occur at a greater than chance probability but not necessarily to cause-effect linkages (eg, HIV and TB – both have a higher probability to coexist, but the one doesn't cause the other). Another example is how low income, low education and substance abuse go together as a "school of fish", but the assumption cannot be made that there is a causal link resulting in the thought that low income causes substance abuse! For intervention to be effective, interventionists should strive to find things that go together. Intervention should thus be built on existing positive structural linkages and how they could be expanded. Therefore interventionists need to know what the linkages are, both in assessment (eg, high frequencies of disruptive behaviour in school tend to co-occur with having problems understanding instructions and tasks) and intervention (eg, changing students' peer-relationships in a positive direction in school tends to co-occur with students' increased academic school success).

### Some important theoretical constructs describing long-term change

General systems theory attempts to explain change that occurs over a longer period of time and the important concepts here are equifinality and self-stabilisation.

#### Equifinality

In open systems, different initial conditions (relations/rules) and processes can lead to the same final state, a process called equifinality<sup>13</sup>; in layman's terms, "All roads lead to Rome." The process of equifinality makes it possible for the interventionist and the family to discuss several intervention options for reaching a certain goal. The interventionist can provide important principles for an intervention, eg, for reaching the goal "reading skills" it is important that the child is exposed to written text, word play and rhymes, but the interventionist should not provide all the rules for attaining the goal. Often conflict arises between parents and professionals because of the professionals' desire to provide all the rules. As an example, interventionists first simply discuss "storybook reading" as the method for intervention, but then they become critical of the manner in which the parents read the story and try to provide specific guidelines as to when and how it should be done.

#### Self-stabilisation

Self-stabilisation refers to the system's ability to respond to internal or external perturbations (difficulties) through reorganising the relations between components. It therefore has to do with maintaining balance and being able to self-regulate. If disturbances become too many, the system needs to reorganise in order to attain balance. If the individual faces too many disturbances, the ability to centralise is lost, implying that things change too quickly. If an individual is already in a state of chaos, change will not have such a great effect. Self-stabilisation processes (as well as

SCA which has already been discussed) have bi-directional feedback loops. Thus, they do not develop in isolation, but through feedback. In a stabilised system there might be many SCAs, as the individual has many things to fall back on if certain SCAs fail. The fewer SCAs a person has, the more vulnerable he is for perturbations affecting SCA. If a child on the autistic spectrum focuses on maintaining anxiety reducing and structure building routines (SCA) he will be anxious and upset if routines can't be performed. However if the child has a good ability for self-stabilisation, eg, by informing the environment that he must be able to perform his routines or by asking for help to understand a new situation, he will not experience high anxiety.

### Specific implications for intervention

Although the focus of this article is on the change achieved through intervention (eg, external physical and or social influences), change due to biological maturation, driven by internal challenges to stability such as organic growth and anatomical differentiation, should not be discounted<sup>9</sup>. Intervention is more successful if matched to biological maturation and ecological changes ie, proactive interventions designed to facilitate positive change are preferable to interventions designed post hoc after a problem has been detected. Using this suggested strengths-based approach has several advantages: (a) the intervention could be implemented within the person's ecological system, prevailing circumstances and culture, etc. (b) it has the possibility to impact multiple outcomes simultaneously, making it more in line with the social model of disability and current views of looking at individuals holistically and (c) it is also possible that building on strengths can provide some measure of protection against later problems, which is a central aspect in positive functioning and self-stabilisation.

The biggest challenge with using systems theory as the frame of reference for designing and implementing intervention is the fact that the exact outcome of intervention on everyday functioning cannot be predicted, neither can the time at which the change will appear be predicted: one can only explain after the change has already happened. Furthermore, when analysing the course of events during intervention, the opportunity of more than one interpretation is always a possibility. Olsson<sup>7</sup> describes these scenarios as kaleidoscopes: each shake will produce a new pattern, despite the fact that the pieces are the same. Thus, in intervention, the interventionist should always remain critical of the intervention given. Questions asked should not only be focused on the mechanics of intervention (ie, on how to implement so called best practices) but also on understanding the process of intervention and changes in interventions over time. One big problem in early childhood intervention is that interventionists tend to stick with the same intervention goals for too long, not realising that goals are a part of the process not a final stage. When the goal for the child is "optimal everyday functioning" goals for intervention have to change relatively quickly. If goals concerning everyday functioning are not attained rather quickly either the goal is not functional or concrete enough or the method is not effective. Questions such as, "How long can a particular outcome be good before it becomes bad?" should thus receive critical scrutiny. Also the methods of intervention must be scrutinised in the light of everyday functioning as a process goal. To sustain the positive outcomes of effective intervention the intervention method must change with changing circumstances. For instance, in a parent-child interaction it might be effective to interact with an infant in a particular style, but the same style cannot be used to interact with a five year old. Recipients of intervention methods in early childhood intervention, such as parents or preschool staff, must therefore understand the principles of intervention in such an in-depth manner that the implementation can be changed and adapted to new or changing circumstances.

However, all coins have two sides. Having argued that goals for intervention should change relatively quickly to avoid the risk of not being optimal any more, one has to take cognisance of the fact that whether or not intervention goals and/or methods should change rapidly must depend on the type of goal. If the focus of intervention is to build on existing strengths and the long-term goal is positive functioning the methods have to focus on skills that increase the ability of the person to change strategies to adapt to new situations and circumstances. This type of focus requires flexible and adaptable methods, but not necessarily quick changes of goals. Rather, the outcome must be redefined, eg, the definition of participation might change with prevailing age or other circumstances, but the goal is still stated as participation in every-



day life situations. If, however, the focus of intervention is to prevent or solve problems, quick changes of goals become more important. Future research that focuses on describing intervention strategies that balance between the system's ability to self-stabilise and the need for external regulation would add valuable knowledge to the field.

An intervention model based on systems theory is often specifically designed to measure change at several system levels, making it particularly well suited for the study of heterogeneous change processes that may underlie treatment progress and outcome<sup>10</sup>. This has intuitive appeal for the early childhood intervention field as intervention is mostly family-based and the measurements therefore need to document not only how the child changes, but also how family and peer relationships change over the course of intervention and follow-up and how these changes indirectly affect the child's functioning (eg, more communication from child and more mutual positivity in parent-child interaction).

In early childhood intervention, research has shown that the context is important both for intervention outcomes, eg, wheelchairs don't work well in rural areas<sup>14</sup> and intervention implementation, eg, time assistive devices are not used in school if the schedule leaves no opportunities for own decisions on how to use time. It implies that interventionists should attempt to build on specificity in ECI, as a specific intervention will not apply equally well to all outcomes and all individuals. Probably the specific diagnosis/ disability label has less value in general interventions focusing on functioning in everyday life<sup>15, 16</sup>, while phenomena related to functioning in all people such as SCA, bifurcation points, centralisation and self-stabilisation become more important. Probably successful intervention strives to teach the individual as little as possible and rather looks at what the individual already has, and tries to build on that.

Intervention operates over a background of time and should aim to break operation of negative causal chains and enhance operation of positive causal chains. A greater focus on aspects such as self-determination, autonomy and self-regulation, which tend to strengthen the system (self-stabilisation) is required, which is also in line with current thinking in the positive psychology field. However, these constructs are culture sensitive and interventionists should understand both the richness and the limitations of the socio-cultural contexts in which children and their families, as well as they themselves, may be operating. Whilst autonomy is regarded as important in most Western countries, it might not be appropriate in all African contexts where there is a greater focus on collectivism and the community.

Theory is a way of seeing and therefore does not tell the whole story, but rather focuses on very specific aspects, whilst intervention is informed on what works on average. This leads to the dilemma which interventionists in the early childhood intervention field experience: intervention strategies are broad-based, whilst specific problems are encountered when looking at an individual child and the parents. One of the biggest dangers of using systems theory is that it may end up in meaningless analogies<sup>13</sup>. One would do well to remember the old Kantian maxim that experience without theory is blind, but theory without experience is mere intellectual play<sup>13</sup>.

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