Evolutionary Advantages of Free Play During Childhood

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Abstract
In a theoretical framework of evolutionary developmental psychology, the present study investigates the assumption that free play during childhood is a condition for the development of individual adaptability, which in turn predicts, first, social success and, second, reproductive success. This hypothesis is tested in a study with 238 adults (75.9% females; 18–90 years). Participants were asked to recollect their free play experiences during childhood in detail, to report their current developmental status with respect to several aspects of social success, and to report the number of (own) children. Furthermore, individual adaptability (flexibility of goal adjustment) is assessed. Results show that the opportunity for free play in childhood significantly predicts both social success and individual adaptability. Social success did not predict reproductive success (number of offspring) directly. However, an indirect effect to the number of offspring was found, mediated by individual adaptability. These results suggest that freely playing in childhood is connected to the development of developmental resources, in particular individual adaptability in adulthood, which, in turn, is related to reproductive success (fitness).

Keywords
individual adaptability, accommodation, free play, evolutionary developmental psychology, social success

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Evolutionary developmental psychology claims that the sequences and processes of human development, in fact the mere fact of ontogeny itself, have to be viewed as evolutionary products (e.g., Bjorklund & Pellegrini, 2002; Burgess & MacDonald, 2005; Ellis & Bjorklund, 2005; Konner, 2010). This poses a puzzling question with respect to many facets of human childhood. Certainly, it is dangerous to be risk prone, playful, and overconfident—in a word: immature. Moreover, we humans experience an extraordinarily long prereproductive period of time (Geary & Bjorklund, 2000; King & Bjorklund, 2010). Hence, there has to be an evolutionary advantage of this huge and risky investment (Bjorklund, 1997; Bjorklund & Green, 1992). Though this does not entail that every single facet of childhood is an adaptation, the costs and risks of this (long) stage has to be outweighed by its gains. Actually, the evolutionary demands are two-fold. First, infancy, childhood, youth, and adolescence have to have their own “ontogenetic” adaptations, respectively, in order to give the developing individual the opportunity to survive these transitory stages (Bjorklund, 1997, 2007; Bjorklund & Pellegrini, 2002). At the same time, however, whatever might be characteristic for these stages, it has to be part of a pathway leading, certainly via intermediate steps, to a reproductive advantage of one sort or another. The adaptive value of immaturity would not make any sense without maturity: Childhood, or central facets of it, arguably have “deferred” adaptations (Bjorklund, 1997; Bjorklund & Gardiner, 2011; Bjorklund & Pellegrini, 2011; Hernández Blasi & Bjorklund, 2003), that is, entail, produce, or contribute to advantages for the crucial point for evolution to occur: reproduction. Whereas sufficient ontogenetic adaptations are the necessary condition for reaching a stage of reproductive maturity (i.e., survival), deferred adaptations are the necessary condition for the evolution of a long childhood to occur in the first place.

Child Play as an Adaptation
Thus, the crucial questions are, first, which attributes or capacities are produced by human development that are useful or

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necessary for reproductive success (i.e., fitness) of adults? (Bjorklund & Pellegrini, 2011), and, second, which facets of childhood contribute to their production? To this end, the present article focuses on the adaptive value of a particular distinguishing aspect of early development: free play (Bjorklund & Pellegrini, 2002). Although it has been frequently argued that there are functional benefits of child play for cognitive and socioemotional development (Barker et al., 2014; Mogel, 2003; Pellegrini, 2011; Singer, Golinkoff, & Hirsh-Pavek, 2009), the “play ethos” critique (Smith, 2010) argues that this functionality assumption of child play is empirically unwarranted. A closer look at the evidence reveals that the empirical support for this claim is mixed, partly weak and, hence, more controversial than common sense suggests (e.g., Lillard et al., 2013). However, the perspective on both ontogenetic and deferred adaptations of child play (Bateson & Martin, 2013) may help to differentiate this discussion. According to this view, claiming child play to be an evolutionary adaptation suggests that play directly or indirectly contributes to evolutionary success, that is, improves conditions of successful development (Bjorklund, 2007; Bjorklund & Pellegrini, 2002, 2011; King & Bjorklund, 2010). Here, several lines of argument are plausible.

**Playing as a Way of (Social) Learning**

One central tenet of an evolutionary developmental perspective is that a long and flexible period of development offers the opportunity to better adapt the individual to varying demands of the particular environment it is born into. Because development is certainly more than just the “unfolding” of a genetic program but rather a dynamic and interactive process (e.g., West-Eberhard, 2003), human ontogeny is characterized by a large degree of plasticity, thus increasing the species’ flexibility (i.e., exploiting the range of its norm of reaction). Through development, we learn what we need in our particular world (niche) in order to survive and reproduce under the given circumstances (Bjorklund & Pellegrini, 2011). Development enables humans to adapt ontogenetically and individually to all kinds of niches.

Both classical theories (from Wygotsky to Piaget; Bodrova, Germeroth, & Leong, 2013; Göncü & Gaskins, 2011, see Pellegrini, 2011) emphasize that child play (in particular social play) is shaped by the respective sociocultural environment and thus offers a unique opportunity for the acquisition of socially accepted or even demanded behavioral patterns (Gray, 2013). Through various forms of social playing (rough and tumble play, pretend play, etc.; Pellegrini, 2009, 2011), we learn through trial and error (no less than through guidance and education) what our social environment requires, and we acquire the competencies that are useful or necessary in our respective environment: the rules of social life (e.g., cooperation, competition, acceptance by peers; Bjorklund, 2007; Gray, 2013; see also Poirier & Smith, 1974). At the same time, to get acquainted with these rules by playing (instead of actually testing them in serious social combat) avoids harsh and lasting social injuries.

However, the social function of play is certainly not sufficient to explain a prolonged childhood because it is, of course, possible to acquire social rules and skills as an adult as well (as migrants, more often than not, demonstrate). Rather, the risks and costs of our (long) childhood have to be outbalanced by more than just one function. Beyond getting better in concrete respects, it seems plausible that child play also improves individuals’ opportunities and prospects for reproduction by the development of more general capabilities. In particular, it has been argued that play contributes to the development of basic processes that contribute to the preparation of the developing individual for later challenges (Bateson & Martin, 2013). Though the (direct) causal relationship between play and certain (cognitive) functions (e.g., Barker et al., 2014; Galyer & Evans, 2001) has not been tested beyond doubt (Lillard et al., 2013), child play might contribute to the development of relevant capabilities of the adult—and thus have deferred adaptations.

**Individual Adaptability as a Resource**

However, the significance of child play in the development of important capabilities of the adult has rarely been investigated. In order to detect developmental concepts that connect childhood and developmental and evolutionary success, it might be fruitful to redirect the search by looking backward, as it were, and to look for capabilities of the adult individual that enable or support his or her successful development and his or her own (or his or her relatives’) reproduction? Once identified it might become easier to look for developmental precursors or preconditions for these capabilities in (early) childhood.

Recent theories of developmental regulation in adulthood particularly emphasize the individual’s capacity for self-regulation, that is, intraindividual processes adjusting either responses to or evaluations of threats and obstacles the individual is confronted with (Baltes, Lindenberger, & Staudinger, 2006; Brandstätter, 2006; Heckhausen, Schulz, & Wrosch, 2010). Although these theories differ from each other with respect to their focus, scope, and mechanisms (and their terminology), they converge in the central tenet that problems (developmental tasks, critical life events, extraordinary challenges, etc.) have to be either actively solved or adaptively dissolved (Boerner & Jopp, 2007; Brandstätter, 2006; Haase, Heckhausen, & Wrosch, 2013). Of particular importance here is the individual’s flexibility to adjust goals, values, and norms if they are blocked or threatened by circumstances and conditions that could not be solved or overcome by means and strategies the individual can control. This particular competence, which is the necessary complement of the individual’s capacity to solve problems actively, is the central concept of the two-process model of developmental regulation (Brandstätter & Renner, 1990; Brandstätter & Rothermund, 2002). In this theory, individual adaptability (termed as “accommodation”) is conceptualized as the individual’s capacity to revise or readjust
his or her own goals in order to bring them in line with the perceived options and restrictions (e.g., by focusing on the good aspects of the problematic situation, by thinking about resulting opportunities or things that can be learned, or by concentrating on new attractive goals). Several studies have shown that this aspect of individual adaptability is an important predictor of successful development throughout adulthood and aging (Brandstätter & Greve, 1994; Brandstätter & Rothermund, 2002, see also Haase et al., 2013).

According to this point of view, humans can readapt individually throughout their whole life span if the demands of the environment or the individual’s capacities should change (e.g., decline of mobility in old age). Hence, individual adaptability should contribute to developmental success (Baltes & Baltes, 1990; Greve, 2015), in particular to social success and hence to reproductive success.

Free Play as a Condition for Individual Adaptability
Child play unites cognitive and emotional adaptations to various circumstances and conditions, thus preparing the developing person for future challenges (Fagen, 2011). Moreover, it creates behavioral innovation both for the playing individual and for his or her observers (Bateson & Martin, 2013). Scholars have even claimed that humans never cease to play, which contributes to their extraordinary adaptability (Huizinga, 1950). However, the assumption that the main evolutionary function is the flexibility characteristic of playing during childhood, plausible as it seems, has seldom been tested (Fagen, 2011; Greve, Thomsen, & Dehio, 2014; Pellegrini, 2009).

Though the tenet that early childhood is crucial for the development of (adult) self-regulation is widely accepted (e.g., Berk et al., 2006; Bodrova et al., 2013), Lillard et al. (2013) questioned this assumption of a necessary causal role of (pretend) play for self-regulation in an extended review. Available evidence, however, does not exclude a supporting function of pretend play for emotion regulation and executive functions (i.e., playing could be one of many routes leading to it). For instance, Pierucci, O’Brien, McInnis, Gilpin, and Barber (2014) found that fantasy-oriented children show specific developmental benefits with respect to their executive functions. Moreover, because studies investigating the connection between (certain forms of) child play and self-regulative competencies mainly focus on cognitive (i.e., executive) functions, the importance of child play for self-regulation in a broader sense (including coping processes beyond emotion regulation) might be underrated. In particular, the individual’s adaptability referred to above (accommodation), although entailing cognitive processes of readjustment (e.g., reframing), includes emotional and behavioral adaptations as well (Brandstätter & Rothermund, 2002). To our knowledge, no study so far has investigated the relation of child play to adult self-regulatory capacities (both in a narrower [cognitive] and a wider [developmental regulation] sense). In an earlier study, we found evidence that adults’ retrospective assessment of their play during childhood is related to the adult’s flexibility of goal adjustment (Greve et al., 2014). Although in this study the retrospective assessment was operationalized as the individual’s subjective evaluation of the degree of freedom, as it were, of his or her child play, the results support the claim that child play contributes to the development of adult capabilities, which in turn are useful or even necessary means of developmental (and evolutionary) success.

Actually, recent studies indicate that the individual’s accommodative capability might be related to experiences in childhood and adolescence. In particular, these studies support the hypothesis that heterogeneity and diversity of an individual’s experience throughout childhood contributes to one’s flexibility. In two cross-sectional studies, heterogeneous and undirected shaping of one’s leisure time during childhood (as reported by the parents) was found to be correlated with cognitive facets of the individual’s flexibility (accommodation) in adolescence (as assessed by a questionnaire; Greve & Thomsen, 2013; Thomsen & Greve, 2013).

Accordingly, we assume that humans, through child free play, not only acquire social and locally adapted competencies but in particular develop the competence to adapt individually, that is develop adaptability (Bateson & Martin, 2013). In contrast to strongly regulated playing (such as, say, learning to play chess or the violin), unguided playing should be of particular use here, for instance the possibility to try out things and to experience, in a sufficiently protected context, unexpected circumstances, both favorite and less favorite. Beyond the development of freely chosen behavior (Gray, 2013), we argue that the heterogeneity of the experiences made through unguided playing, in particular, should have an impact on the individual’s development. The more, and the more freely, we play, the greater the diversity of experiences we make, and, thus, the greater our accommodative flexibility in adulthood. The degree of the individual’s flexibility (adaptability), in turn, is claimed to be one important aspect of the relationship between child play on the one hand and developmental and evolutionary success on the other hand. At the same time, adaptability not only is a sample case for deferred adaptations (because it is a mediating precondition for social and evolutionary success) but stabilizes the child’s quality of life (Thomsen, Fritz, Mößle, & Greve, 2015) and is thus an ontogenetic adaptation as well.

Aims of the Present Study
According to the arguments discussed in the previous section, we expect that, first, child free play is one important source for the development of individual adaptability in adulthood. Second, individual adaptivity should predict the individual’s social and evolutionary success.

Accordingly, the aim of the present article is twofold. First, we aim at a replication (with enhanced measures) of the finding of an earlier study (Greve et al., 2014) that the prediction of social success by child play is mediated by individual’s adaptability. In the earlier study, (free) play in childhood was assessed with a questionnaire that asked the participants’ judgment of their play in childhood, thus leaving the influence
of biases (such as social desirability) uncontrollable. As a consequence, we aimed at a more detailed and less evaluative assessment of the participants’ child play (see Method section). Second, if the theories of successful development and developmental regulation mentioned were right, the individual’s adaptability (accommodation) should be relevant for his or her fitness as well. Hence, individual flexibility should predict (additionally or independently) the number of one’s offspring. Furthermore, if social success can be seen as an indicator for developmental success (e.g., as a valuable means for attracting partners and raising children, Buss, 2011), it is expected to either directly or indirectly contribute to evolutionary success (number of offspring). Certainly, in modern societies, the number of offspring seems to be inversely related to indicators of social success; hence, we did not expect a strong relation for our (Western) sample. However, the adaptive value of the individual’s adaptability should be reflected in the reproductive success because otherwise it could not count as an (evolutionary) adaptation.

Concretely, in a first step, we expected a high degree of free play experienced in childhood to be predictive for social success in adulthood. Here, we defined childhood as the time period between the beginning of kindergarten (by the age of 3) and the end of elementary school (by the age of 10). Moreover, we hypothesized individual adaptability (as assessed by “flexibility of goal adjustment”; Brandstädter & Renner, 1990) to be a mediator of the relationship between free play in childhood and social success in adulthood (Hypothesis 1). In a second step (Hypothesis 2), we assumed that both adaptability and social success predict the number of offspring. If adaptability is an important means of improving the individual’s fitness, it is expected to mediate an indirect effect of social success on the number of offspring.

Method
Design and Procedure
The present study was conducted as a cross-sectional questionnaire study in several smaller cities in northern Germany (Lower Saxony) with participants in adulthood across different ages. Questionnaires were distributed in various ways (including personal networks, adult education centers, companies, associations and clubs, and the University of Hildesheim). After completion, the questionnaires were collected or participants were requested to send or bring them back to the authors’ university address. All data were collected anonymously.

Participants
The sample consists of 238 participants aged 18–90 (M = 55.43, SD = 14.03). Three-quarters of the sample were female (75.9%). All education levels were represented over the sample (21.7% base-level “German Hauptschule,” 35.8% intermediate-level “German Realschule,” 12.8% academic-level “German Abitur,” and 28.2% university level), and the mean monthly family income was between 2.000 and 4.000 € (netto).

Measures
Indicators of free play during childhood. Free play in childhood, operationalized as the life period from 3 to 10 years, was assessed in two ways.

Frequency of free play. Participants were asked how often (from 1 = never to 7 = very often, scale points in between were unlabeled) they played nine free play leisure activities: (1) free play in play areas; (2) free adventure play; (3) free play on the streets; (4) free play in nature; (5) painting and doodling; (6) building houses, castles, and caves; (7) kneading and textile design; (8) face painting and dress up; and (9) making up stories or fantasy worlds. Subsequently, the arithmetic mean over all items was calculated, the internal consistency (Cronbach’s α) was α = .83.

Subjective experience of free play. Here, we first assessed participants’ emotional state when thinking back to their childhood. At the end of the questionnaire, the emotional state was assessed by a smiley scale, showing five smilies with 1 = a very sad to 5 = a very happy face. Participants were asked to mark a cross on the smiley that best represented their emotional state when looking back on their childhood. In order to create an indicator for participants’ subjective experience of free play in childhood, we then multiplied the score of free play during childhood (see above) with the emotional state score.

Social success. Participants’ social success was assessed with a scale that was used in an earlier study (Greve et al., 2014). Based on 10 items, participants had to estimate heterogeneous possible indicators for social success, such as their social relationships (e.g., “Friends come to ask me for advice”), their social support system (e.g., “If something goes wrong, I have friends by my side that support me”), or their social acceptance (e.g., “My work is appreciated by others”). Each item had to be answered on a 5-point Likert-type scale (from 1 = disagree completely to 5 = agree completely). The arithmetical mean across all items was calculated, the internal consistency was α = .81.

Flexible goal adjustment (FGA). Participants’ flexibility was assessed with the FGA Scale (Brandstädter & Renner, 1990). The scale contained 15 items (e.g., “Sometimes things in life don’t go the way you want them to. But I still find it easy to see the good in the unpleasant things in life”), and each item had to be answered on a 5-point Likert-type scale (1 = disagree completely to 5 = agree completely). The scale was constructed by calculating the arithmetical mean across the items, the internal consistency was α = .84.

Number of offspring. Number of offspring was assessed by asking participants how many children they have (M = 1.86, SD = 1.06). 13.7% Participants were childless, 17.2% had one
child, 44.6% had two children, 18.5% had three children, and 6% had four children.

**Statistical Analyses**

First, bivariate correlations between all study variables were calculated. In order to detect possible cohort effects, all study variables were correlated with participants’ age and education level. Second, two separate regression analyses were conducted to investigate Hypothesis 1, assuming that FGA mediates the relationship between free play in childhood and social success in adulthood. Here, the first mediation analysis was calculated with the free play indicator “frequency of free play” (Model 1a), while the second analysis investigated the other free play indicator “subjective experience with free play” (Model 1b). Third, in order to test Hypothesis 2, a third regression analysis, investigating the mediating role of FGA in the relation between social success and the number of offspring (Model 2), was conducted. All regression analyses were calculated with Mplus 6 (Muthen & Muthen, 1998–2010).

**Results**

**Bivariate Results**

As expected, a significant positive correlation (see Table 1) between both free play and subjective experience of free play in childhood and social success in adulthood was found. Moreover, both indicators of free play correlated positively with both indicators of free play and social success. Number of offspring was significantly positively related to FGA, and, second, that flexible goals adjustment was significantly related to social success. Moreover, both free play indicators were related to social success. Testing the indirect pathways in the models, both mediation analyses showed significant indirect effects, indicating that FGA partially mediates the relation between free play in childhood and social success in adulthood. Free play and FGA explained 30.0% (\(p < .01\)) of the variance in social success within Model 1a and 32.9% (\(p < .01\)) in Model 1b. Both models showed, according to Hu and Bentler (1999), good model fits (Table 2).^1^ Regression analysis for Hypothesis 2 showed, first, that social success was significantly related to FGA, and, second, that FGA was significantly related to the number of offspring. Social success and the number of offspring, however, were not correlated (\(p = .07\)). Testing possible indirect effects (Hayes, 2013, p. 87ff), analyses revealed a significant indirect effect, indicating that the weak relation between social success and the number of offspring was fully mediated by FGA. Social success and FGA explained 6.9% (\(p < .05\)) of the variance in the number of offspring. Again, the model showed a good model fit (Table 2). Findings of the three mediation analyses are visualized in Figure 1.

**Discussion**

The results of this study support, first, the assumptions that child free play in fact is a predictor of both the individual’s adaptability to problems and obstacles that could not be overcome by active efforts (i.e., FGA in terms of the two-process model of development; Brandstädter & Rothermund, 2002) and of social success. Second, individual adaptability (flexibility of goal adjustment) was found to be a mediator of the positive relationship between free play and social success. These results replicate (and extend) findings of an earlier study (Greve et al., 2014). Third, although we found that social success did not directly predict the individual’s number of offspring, it was indirectly related via the individual’s adaptability, which mediated the expected relation completely.

It goes without saying that child play is not the sole, plausibly not even the most important predictor of social success. Actually, the correlation found in this study was, in our view, surprisingly high for such a “distant” variable, thus supporting the basic argument from the evolutionary

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**Table 1. Descriptive Statistics and Intercorrelations Among Study Variables.**

| Variable                              | N  | M  | SD | Min–Max | 2    | 3    | 4    | 5    | 6    | 7    |
|---------------------------------------|----|----|----|---------|------|------|------|------|------|------|
| 1. Frequency of free play             | 237| 4.17| 1.17| 1.33–5.65| .91**| .36**| .21**| .03  | −.48**| .28**|
| 2. Subjective experience of free play | 231| 17.58| 6.68| 3.11–32.78| .42**| .26**| .05  | −.45**| .27**|
| 3. Social success                     | 236| 3.81| 0.56| 1.60–4.90| .44**| .12  | −.18**| .23**|
| 4. Flexible goal adjustment           | 238| 3.53| 0.52| 1.60–4.73| .27**| .04  | .03  |
| 5. Number of offspring                | 233| 1.86| 1.06| 0–4     | .10  | .03  |
| 6. Age                                | 237| 55.43| 14.03| 18–90   | −.36**|
| 7. Education level                    | 226|     |     | 1–4     |      |      |

**p < .01.**
developmental perspective. The bivariate correlation between the proximal predictor of success (adaptability) was higher—supporting our assumption that it is in fact a proximal condition. Moreover, the replicated finding that free play predicts the adult individual’s adaptability (i.e., flexibility of goal adjustment) fits other findings indicating that the heterogeneity of early experiences is an important condition for the development of individual adaptability (Greve & Thomsen, 2013; Thomsen & Greve, 2013). At the same time, it might qualify Lillard et al.’s (2013) conclusion that child (pretend) play does not predict self-regulation. The present study might contribute to an extension of the discussion of possible functional or developmental benefits of (forms of) child play beyond “immediate” functional improvements; rather, deferred adaptations might be somewhat undervalued in the literature so far. Because the present study focuses on free play (certainly including forms of pretend play) in childhood on the one hand and an adult form of self-regulation (Brandstätter & Rothermund, 2002) on the other, we would like to suggest a closer look at possible relations between child play and adult capabilities in future studies. Certainly, longitudinal studies (encompassing decades) are needed to more firmly support causal conclusions.

As we already mentioned in the Introduction, the play ethos critique (Smith, 2010), stating the claim that child play actually is developmentally functional to be empirically unwarranted, certainly has its merits (Lillard et al., 2013). However, the perspective on both ontogenetic and deferred adaptations of childhood in general and (certain forms of) child play in particular (Bateson & Martin, 2013) may help to differentiate this discussion a little further. If the benefits of child free play on adult forms of self-regulation would prove tenable in longitudinal studies, the objection of a weak relation to children’s self-regulation might be less severe.

Table 2. Regression Analyses.

| Regression Paths                  | B     | SE B | β    | p   | χ²   | p    | CFI  | RMSEA | SRMR |
|-----------------------------------|-------|------|------|-----|------|------|------|-------|------|
| Model 1a                          |       |      |      |     |      |      |      |       |      |
| Mediation a path (FGA on FFP)     | 0.13  | 0.03 | 0.29 | .00 | 3.72 | .00  | 1.00 | 0.00  | 0.00 |
| Mediation b path (SS on FGA)      | 0.41  | 0.06 | 0.39 | .00 | 0.20 | .65  | 1.00 | 0.00  | 0.00 |
| Total effect. c path (SS on FFP, excluding FGA as mediator) | 0.18  | 0.05 | 0.38 | .00 | 0.03 | .86  | 1.00 | 0.00  | 0.00 |
| Direct effect c’ (SS on FFP, including FGA as mediator) | 0.13  | 0.03 | 0.27 | .00 | 0.03 | .86  | 1.00 | 0.00  | 0.00 |
| Indirect effect c – c’            | 0.05  | 0.02 | 0.11 | .00 |      |      |      |       |      |
| Model 1b                          |       |      |      |     |      |      |      |       |      |
| Mediation a path (FGA on SEFP)    | 0.03  | 0.01 | 0.33 | .00 | 0.03 | .86  | 1.00 | 0.00  | 0.00 |
| Mediation b path (SS on FGA)      | 0.39  | 0.01 | 0.37 | .00 | 0.03 | .86  | 1.00 | 0.00  | 0.00 |
| Total effect. c path (SS on SEFP, excluding FGA as mediator) | 0.04  | 0.01 | 0.43 | .00 | 0.02 | .81  | 1.00 | 0.00  | 0.00 |
| Direct effect c’ (SS on SEFP, including FGA as mediator) | 0.03  | 0.06 | 0.31 | .00 | 0.03 | .86  | 1.00 | 0.00  | 0.00 |
| Indirect effect c – c’            | 0.01  | 0.00 | 0.12 | .00 |      |      |      |       |      |
| Model 2                           |       |      |      |     |      |      |      |       |      |
| Mediation a path (FGA on SS)      | 0.42  | 0.06 | 0.45 | .00 | 1.68 | .10  | 1.00 | 0.00  | 0.00 |
| Mediation b path (NO on FGA)      | 0.53  | 0.15 | 0.26 | .00 | 0.03 | .86  | 1.00 | 0.00  | 0.00 |
| Total effect. c path (NO on SS, excluding FGA as mediator) | 0.23  | 0.13 | 0.12 | .06 | 0.04 | .80  | 1.00 | 0.00  | 0.00 |
| Direct effect c’ (NO on SS, including FGA as mediator) | 0.01  | 0.14 | 0.00 | .95 | 0.01 | .80  | 1.00 | 0.00  | 0.00 |
| Indirect effect c – c’            | 0.22  | 0.13 | 0.12 | .01 |      |      |      |       |      |

Note. FGA = flexible goal adjustment; FFP = frequency of free play; SS = social success; SEFP = subjective experience of free play; NO = number of offspring.

Figure 1. Framework for the direct and mediating effects tested in this study. Significant pathways displayed as bold lines and nonsignificant pathways as dashed lines.
number of offspring, which supports the assumption that a plausible pathway leads from child play to evolutionary functions. The fact that we did not find a direct correlation between free play and the number of offspring might be explainable for several reasons. First, because the number of offspring is generally low in humans, a significant correlation to one distal predictor might need more power to become detectable. Second, in modern Western societies social success might nowadays be weakly (or even negatively) correlated with the number of offspring. A study including different (i.e., non-Western) cultures would probably show closer (positive) relationships. However, the general argument for evolutionary benefits of child play presupposes the number of offspring as the ultimate criterion. In fact, the level of adaptability as a predictor of reproduction and as a criterion for social success supports the claim that child free play might be a starting condition for a chain of deferred adaptations. Third, one possible explanation for the fact that social success did not directly predict the number of offspring might be that having (many) children may have diminishing effects on some indicators of social success (e.g., appreciation of one’s work by others). Here, more comprehensive studies, including more predictors of having offspring, would be valuable. In particular, further studies should differentiate the measure of offspring (e.g., asking for pregnancies, non-surviving offspring vs. surviving offspring); the present study just asked for surviving children, but this might underestimate the impact of both play and social success for one’s reproductive behavior.

Several limitations of the present study have to be acknowledged. First, due to the cross-sectional nature of the data reported in this study, it cannot be excluded that the causal chain runs to the reverse as well, in particular for the relationship between individual adaptability and reproduction. It is possible that individual flexibility is, partly at least, prompted (caused) by the number of offspring (the more children I raise, the more flexible I have to be). However, in the modern world the decision to bear children is actually a decision that entails a bundle of considerations, including weighing different goals and restrictions, (re)arranging different life goals and plans, adjusting individual values—in short: accommodative processes. Thus, the theoretical assumption that the decision to bear children presupposes (a certain degree of) accommodation seems to be plausible. However, a longitudinal confirmation of the predictive value of child play is needed.

Second, the retrospective assessment of child free play still entails methodical restrictions. To begin with, we cannot exclude that the validity of one’s memories is negatively correlated with age. However, there is empirical evidence indicating that the decline of memory capacity with age mostly harms the most recent memories and leaves earlier (biographical) memories unscathed (e.g., Rubin, Wetzler, & Nebes, 1986). The negative correlation of free play with age ($r = -0.48$) might rather be the result of a cohort effect. In order to deal with this problem, age was controlled for in the analyses presented. A longitudinal study measuring both aspects directly would certainly be the method of choice but would, of course, require huge efforts (i.e., decades). Moreover, although the very detailed assessment used in this study certainly goes beyond the summative and evaluative assessment used in the earlier study (Greve et al., 2014), the present data still cannot exclude the possibility that social success and individual flexibility enhance more positive memories of one’s childhood. In order to prevent this effect, the “free forms” of play were selected among a huge variety of play forms that we presented to the participants, and it was certainly not clear to them from the outset which forms of play are to be seen as “socially desirable.” However, this problem can only be solved in a longitudinal study (e.g., using observational data).

Third, future investigations should include additional predictors of social success (e.g., social skills and tendencies). In particular, “assimilative” regulatory competencies as the second category of metacompetencies in the framework of the two-process model of developmental regulation predicting successful development should be important. In this respect, free play as well as guided play (education) should be important to develop this capacity of active problem-solving (e.g., by means of varying strategies and efforts; Gray, 2013; Kopp, 1982; Skinner & Zimmer-Gembeck, 2011).

Finally, although it is plausible that the heterogeneity and variability of the individuals’ experiences (as prototypically represented in freely chosen child play) is a developmental condition for individual adaptability (i.e., accommodative self-regulatory capacities; Greve & Thomsen, 2013; Thomsen & Greve, 2013), there is more to say about the development of adaptability. Certainly, child play is just one of several developmental conditions of individual adaptability (Meyer & Greve, 2012). It would be useful to include other developmental conditions in future studies (e.g., cognitive capabilities; Lessing, Thomsen, Greve, & Mählé, 2016).

One general limitation of the present study (and of many, if not most, studies within the realm of evolutionary psychology) is the unavoidable restriction to ontogenetic answers (analyses) for phylogenetic questions (hypotheses). The study corroborates the hypothesis that child free play contributes to the development of the individual’s adaptability, which, in turn, contributes to the individual’s social and reproductive success. This supports the hypothesis that the (development of) individual adaptability could be a particular advantage of adult humans and, hence, an important part of the evolutionary explanation of the extended prereproductive stages of human development.

In any case, the present results support the considerations discussed in the first section of the article. A prolonged development deserves explanation due to the risks associated with it. A possible explanation might be that it offers the opportunity to develop individual adaptability necessary for social and, thus, evolutionary success. Thus, the present results strongly support Bjorklund’s (2007) suggestion that children and juveniles not only deserve, but in fact need, their childhood and youth in general and possibilities of free, unguided, and unrestricted play in particular.
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Note

1. In order to investigate whether the type (content) of play made any significant difference, we ran a factor analysis on the nine types of play assessed in the frequency of free play scale. A two-factor solution resulted, one factor included “more outside free play activities” (free adventure play, free play on the streets, free play in nature, building houses, castles, and caves) and the other included “more inside free play activities” (painting and doodling, kneading and textile design, face painting and dress up, making up stories or fantasy worlds). One item loaded equally on both factors (free play in play areas) and thus was excluded. Both factors were correlated ($r = .55, p < .01$). Moreover, the “inside free play” factor was correlated with gender (higher scores for females, $r = .23, p < .01$), while the “outside free play” factor was not related to gender. However, both factors were almost equally related to the other variables of the study (subjective free play, social success, offspring, age, education), and the results were comparable to the correlation coefficients reported for the whole scale in Table 1. The only exception was found for flexible goal adjustment (FGA), here, outside free play was significantly related to FGA ($r = .27, p < .01$), whereas the relation of the inside free play factor to FGA was not significant ($p = .07$). In sum, the convergence of the results indicates that splitting up the free play scale would not add relevant information. Moreover, the combined analysis is conservative with respect to our hypotheses.

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