

FIELD DEPENDENT–INDEPENDENT COGNITIVE STYLE AND CREATIVITY FROM THE PROCESS AND PRODUCT-ORIENTED APPROACHES: A SYSTEMATIC REVIEW

Marco GIANCOLA *, Massimiliano PALMIERO, Simonetta D'AMICO

*Department of Biotechnological and Applied Clinical Sciences,
University of L'Aquila, Via Vetoio 1, 67100 L'Aquila, Italy*

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Abstract. Creativity is a multifaceted construct that can be defined both in terms of process (*e.g.*, divergent thinking) and product (*e.g.*, a poem). Across years, it has been related to different cognitive and personality variables, including cognitive styles. The current systematic review aimed to summarize the literature on the relationships between field dependence–independence and creativity, considering both the creative process and creative production approaches. We selected eight studies using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses rules. Findings revealed that a consistent number of studies focused on creative process mainly in terms of divergent thinking instead of convergent thinking, also providing misleading results. Additionally, only two studies focused on creative production, showing that field independents were more creative than field dependents. Given the contradictory results and the paucity of studies, we concluded that the association between field dependence–independence and creativity needs to be further investigated by more accurate empirical explorations. Limitations and future research directions are discussed.

Keywords: cognitive styles, creativity, divergent thinking, field dependence–independence, real-world creative production, systematic review.

Introduction

The phenomenon of creativity seems to affect different domains of human endeavors, including not only art and science (Batt et al., 2010) but also everyday problem solving (Cropley, 1990; Kaufman & Beghetto, 2009), social behaviors (Fancourt & Steptoe, 2019) and well-being (Arbuthnott & Sutter, 2019). For this reason, creativity has been recognized as one of the four major skills in the 21st century, along with critical thinking, communication, and collaboration (Qian et al., 2019), representing “a key human attribute that pushes our civilization forward” (Acar et al., 2021, p. 738).

In the past, creativity has been detected through different perspectives, including the creative process and creative production approaches. The process-oriented approach mainly lies

*Corresponding author. E-mail: marco.giancola@graduate.univaq.it

in the notions of divergent thinking (DT) and convergent thinking (CT). DT allows people to produce as many new ideas or solutions as possible for solving open-ended problems or tasks. It is broadly considered a reliable measure of individual creative potential (Runco & Acar, 2012), an indicator of everyday creativity (little-c) (Kaufman & Beghetto, 2009), as well as an essential determinant of creative achievement (Hee Kim, 2008). Conversely, CT is portrayed as the ability to find a single and correct solution to a problem analytically (Guilford, 1967). According to Guilford's (1967) structure of intellect model, both DT and CT are the main components of creative thinking, playing a pivotal role in people's creativity.

On the other hand, the product-oriented approach relies on generating real-world creative outcomes either in tangible (*e.g.*, music, written documents or buildings) or intangible forms (*e.g.*, scientific theories or plans and strategies in business), exemplifying the public face of creativity (Cropley, 2006). Although different attributes can be used to define creative inventions (*e.g.*, aesthetic, elegance, and the like), according to the product perspective (*e.g.*, Kaufman & Sternberg, 2010; Sternberg & Lubart, 1991), originality and appropriateness are considered the primary criteria. Originality represents the degree of novelty, unusualness, and rarity of inventions, whilst appropriateness reflects the usefulness and relevance of such productions within a specific context (Abraham, 2018). Amabile (2018) argued that this bipartite definition of creativity is needed since inventions that are judged original, unusual or novel but carry no use or meaning can be perceived as weird or bizarre only (Rosengren et al., 2020).

Across years, taking into consideration both process and product perspectives, creativity has been analyzed by exploring cognitive and extra-cognitive determinants (*e.g.*, Benedek et al., 2014; Frith et al., 2021; Palmiero et al., 2019; Chávez-Eakle et al., 2012; Fink & Woschnjak, 2011; Giancola et al., 2021; Palmiero et al., 2020), including the impact of cognitive styles (*e.g.*, Martinsen, 1997; Palmiero et al., 2016). They refer to the individual predisposition to acquire, organize, and use information across situations (Kozhevnikov et al., 2005), depicting one of the main individual resources involved in creativity, along with intelligence, personality, motivation, knowledge and so forth (Sternberg & Lubart, 1991). Although a multitude of cognitive styles can be distinguished (Sternberg & Grigorenko, 1997), they are usually conceived as bipolar (*e.g.*, visualizer *versus* verbalizer; holistic *versus* analytic), relatively stable over time, representing a critical dimension of the individual functioning and behaving. Amongst all cognitive styles, the field dependence–independence (FDI) has attracted a great deal of empirical attention, generating a significant amount of research since Herman Witkin and colleagues' work (*e.g.*, Witkin & Asch, 1948; Witkin et al., 1977). FDI has been widely considered the most studied cognitive style in psychology research (Mefoh et al., 2017), and its impact on individuals' performance has been widely acknowledged. FDI reflects “the extent to which the person perceives part of a field as discrete from the surrounding field as a whole, rather than embedded in the field” (Witkin et al., 1977, pp. 6–7).

The interplay between FDI and creativity has been long discussed until around 1980 when the attention and popularity of such a cognitive style drastically decreased. However, since the 2000s, a new wave of interest has characterized the research on the FDI–creativity link.

Even though reviews on this topic can be found in the literature (*e.g.*, Bloomberg, 1967; Zhang, 2017), to our knowledge, no systematic reviews have been carried out to date.

Therefore, the current article aimed to summarize the literature on the relationships between FDI and creativity, considering both creative process and creative production approaches. This dual perspective allows identifying, on the one hand, studies on the interplay between FDI and the individual disposition to think creatively (FDI in relation to creative potential measures such as DT and CT) and, on the other hand, studies on the role of FDI in the ability to generate actual real-world creative inventions.

1. Method

1.1. Literature search strategy

The three authors conducted the online search independently. In order to identify studies for the systematic review, a comprehensive electronic literature search was done through three different electronic datasets (*PubMed*, *Web of Science*, and *Scopus*) in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Liberati et al., 2009). In order to identify the articles that showed the association between FDI and both creative process and creative product, the following keywords were used: *creativity*, *creative thinking*, *divergent thinking*, *convergent thinking*, *creative process*, *creative product*, *art*, *field dependent*, *field independent*, *field dependence*, *field independence*, *cognitive style*, *intellectual style*. The systematic search ended on June 30, 2021.

1.2. Inclusion and exclusion criteria

To explore the direct relationships between FDI and creativity (process or product), studies were selected if they met the following criteria: a) peer-reviewed journal articles published in English; no reviews, meta-analyses, case reports, letters to the editor, conference articles or book chapters; b) studies using creative process or creative product based on performance tasks and including measures of originality, appropriateness or creativity; no study based on merged scores of creative process and creative production (*e.g.*, divergent thinking, plus creative preference assessed by performance tasks, plus creative personality assessed by a questionnaire, see Bloomberg, 1971), self-report creativity (Fergusson, 1992, 1993), and based on non-creativity measures (*e.g.*, technical proficiency, such as occlusion, base line, perspective, see Riding & Pearson, 1987); c) studies using FDI standardized measures (*e.g.*, the Embedded Figures Test (EFT)); no study based on composite measures of FDI (*e.g.*, the Group Embedded Figures Test (GEFT) plus the Hidden Figure Test (HFT) plus the SOI Learning Abilities Test, see Borland 1988, or mobility–fixity measures, see Niaz et al., 2000; Noppe, 1985); d) studies on differences between expert (*e.g.*, artists) and non-expert; e) studies on healthy subjects, regardless of the age; no study based on clinical samples.

1.3. Study selection and data collection

First, literature was evaluated, by the three authors, considering duplicates, followed by a screening of titles and abstracts. After that, results were screened in full text if considered eligible, and for each included research, the following data were extracted: 1) research design;

2) statistical analyses; 3) sample characteristics including size, age, and gender; 4) type of FDI measures; 5) type of creativity measures, 6) focus on creativity (process *versus* product), and 7) findings.

2. Results

2.1. Number of selected studies

Duplicates were removed from 17 639 initial records, leading to 9088 remaining records, which were screened by titles and abstracts. A total of 9067 records were excluded, twenty one articles were assessed for eligibility and screened by full text. Thirteen articles were excluded (see reasons for discarding full text in Figure 1) and eight papers were considered suitable for this systematic review. Figure 1 shows the flow diagram of the extracted articles by the selection process.

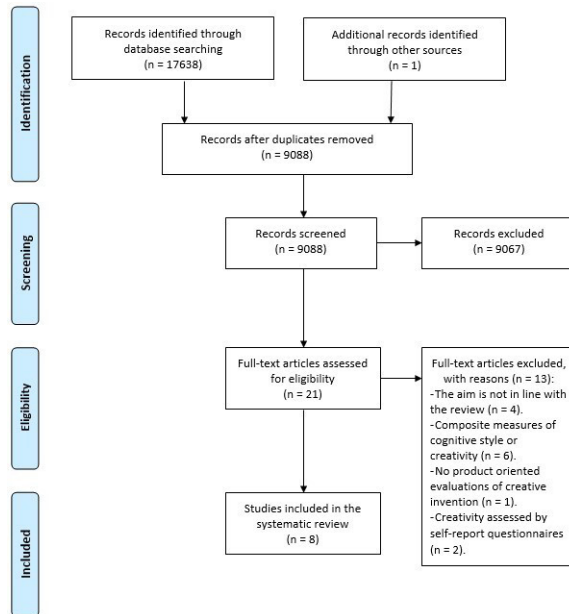


Figure 1. Flow diagram of the extracted studies (source: created by authors)

2.2. Study design and sample characteristics

Table 1 synthesizes the main characteristics of the studies included in this systematic review. All the eight articles selected for this systematic review hypothesized a relation between FDI and creativity, and they were published from 1967 to 2020. Of the eight articles, four employed a between study design (Lei et al., 2021; Li et al., 2020; Miller, 2007; Saracho, 1992), three a correlational study design (Baranovská et al., 2017; Fergusson, 1992, 1993; Saurenman & Michael, 1980), and one used both between and correlational research designs (Noppe & Gallagher, 1977).

Table 1. The main characteristics of the studies including the systematic review (source: created by authors)

Authors (years)	Research design	Statistical analyses	Sample characteristics	Field dependence-independence measures	Creativity measures	Focus on creativity	Findings
Spotts and Mackler (1967)	Correlational	PPMC	N = 138 (138 M). Range = N.D. Mean = N.D. SD = N.D. Undergraduate students	EFT – JSF apparatus: 1 test trial of 12 items. Scoring: time to locate the simple figure within the complex design. Rapid solutions = FI. Slow solutions = FD. HFT apparatus: 16 complex designs with a simple figure embedded in each design. Scoring: accuracy high score = FI, low score = FD.	AGT parameters: fluency, adequacy, and flexibility. TCT parameters: flexibility, fluency, and originality. CIT parameters: fluency, flexibility, elaboration, and originality. DET parameters: fluency, flexibility, elaboration, and originality.	Creative process	The EFT negatively correlated with originality and elaboration of the CIT; fluency, flexibility, and originality of the DET. The HFT positively correlated with fluency and flexibility of the AGT; elaboration of the CIT; fluency, flexibility, and originality of the TCT. In addition, the HFT negatively correlated with the originality of the CIT.

Continue of Table 1

Authors (years)	Research design	Statistical analyses	Sample characteristics	Field dependence-independence measures	Creativity measures	Focus on creativity	Findings
Noppe and Gallagher (1977)	Between model Correlational	t-test PPMC	N = 45 (9 M; 36 F). Range = N.D. Mean = N.D. SD = N.D. Education majors	GEFT apparatus: I part = 7 items (practice). II part = 18 items (test). Total items = 25. Scoring: accuracy. Median split	RAT 30 items parameters: accuracy.	Creative process	Field independents attained significant higher RAT scores than field dependents. In addition, the GEFT positively correlated with the RAT score.
Saurenmanand Michael (1980)	Correlational	N.D.	N = 96 (gender: N.D.). Range = 9.6-12.4. Mean = 10.9. SD = 3.8. Low achievement N = 48. High achievement N = 48.	GEFT apparatus: I set = 7 items (practice). II part = 9 items (test). III part = 9 items (test). Total items = 25. Scoring: accuracy.	DFC parameters: total score. DSU parameters: total score.	Creative process	Dividing the sample into children with low and high achievement, the GEFT positively correlated with DFC and DSU in the low achievement subsample.
Saracho (1992)	Between model	MANOVA: 2 (FD, FI) x 2 (gender) x 3 (age) x 4 (play behaviour).	N=300 (150 M; 150 F). Range = 3–5. Mean = N.D. SD = N.D. Group 1 (3 years old): N = 100 (50 M; 50 F). Group 2 (4 years old): N = 100 (50 M; 50 F). Group 3 (5 years old): N = 100 (50 M; 50 F).	PEFT apparatus: 24 items. Scoring: Group 1: ≤ 4 = FD, ≥ 5 = FI. Group 2: <10 = FD, >10 = FI. Group 3: <10 = FD, >10 = FI.	PRS Parameters: creativity in communicating ideas, frequency of play, social play, and dramatic play assessed by three graduate students in early childhood education. Average inter-rater reliability = .94.	Creative product	Field independents were better in PRS creative communication ideas score, considering the total sample.

Continue of Table 1

Authors (years)	Research design	Statistical analyses	Sample characteristics	Field dependence-independence measures	Creativity measures	Focus on creativity	Findings
Miller (2007)	Between model	ANCOVA: evaluation condition was the categorical variable; cognitive style and the term of interaction were included as continuous variables; amount of time spent on collage (continuous) and previous art experience (categorical, yes or no) were covariates.	N = 90 (30 M; 60 F). Range = 18–32. Mean = 19.74. SD = N.D.	GEFT apparatus: I set = 7 items (practice). II part = 9 items (test). III part = 9 items (test). Total items = 25. Scoring: accuracy.	CMT parameters: creativity score assessed by a set of independent judges following the CAT. Inter-rater reliability is not reported.	Creative product	Field independents outperform field dependents: the higher the GEFT score, the higher the creativity score. There is no significant effect of expected evaluation, probably due to the extrinsic motivation effect.
Baranovská et al. (2017)	Correlational	SC	N = 148 (53 M; 95 F). Range = 18–19. Mean = N.D. SD = N.D.	GEFT apparatus: I part = 7 items (practice). II part = 9 items (test). III part = 9 items (test). Total items = 25. Scoring: accuracy.	TTCT-F – CIT parameters: fluency, flexibility, originality, and elaboration.	Creative process	A positive and significant correlation has been found between the GEFT score and the elaboration score of the TTCT-F (CIT). No significant correlations have been found between GEFT scores and the other TTCT parameters.

Continue of Table 1

Authors (years)	Research design	Statistical analyses	Sample characteristics	Field dependence-independence measures	Creativity measures	Focus on creativity	Findings
Lei et al. (2021)	Study 1: between model	Study 1: MANOVA: 2 (expected evaluation: yes, no) x 2 (FD, FI).	Study 1: N = 89 (46.2 % M; 53.8 % F). Range = N.D. Mean = 16.31. SD = .59.	Study 1: EFT apparatus: N.D. Scoring: T scores. T scores less than 50 = FD T scores above than 50 = FI.	Study 1: TTCT – the unique use of TCT parameters: fluency, flexibility, and originality.	Creative process	Study 1: significant main effect of FDI on fluency and originality (FD > FI). No significant main effect of FDI on flexibility. FDI moderates the interplay between expected evaluation and DET performance: FD produced more original ideas than FI with expected evaluation than those without evaluation. Study 2: significant main effect of FDI on fluency and originality (FI > FD). No significant main effect of FDI on flexibility. No moderation effect of FDI on the relation between evaluation type and DET in terms of fluency, flexibility, and originality.
	Study 2: between model	Study 2: MANOVA: 2 (evaluation type: informational versus controlling) x 2 (FD, FI).	Study 2: N = 92 (59.8% M; 40.2% F). Range = N.D. Mean = 16.03. SD = .67.	Study 2: EFT apparatus: N.D. Scoring: total score = N.D. T scores: T scores less than 50 = FD T scores above than 50 = FI.	Study 2: TTCT – the unique use of TCT parameters: fluency, flexibility and originality.		

Continue of Table 1

Authors (years)	Research design	Statistical analyses	Sample characteristics	Field dependence–independence measures	Creativity measures	Focus on creativity	Findings
Li et al. (2020)	Study 1: between model	Study 1: ANOVA: 2 (ST, SCT) × 2 (FD, FI).	Study 1: N = 40 (7 M; 33 F). Range = 17–24. Mean = 20.20. SD = 1.60.	Study 1: EFT apparatus: I part = 9 items (practice). II part = 10 items (test). III part = 10 items (test). Total items = 29. Scoring: I part = 0 points. II part = 12 points. III part = 12 points. Total score = 24 points. Top 30% (≤ 13.50 points) = FD. Bottom 30% (≥ 17.50) = FI.	Study 1: BTs: 1) SCT – what would the world be like without gravity? Parameters: fluency, flexibility and novelty. 2) ST – how can we make our school (university) better? Parameters: fluency, flexibility and novelty.	Creative process	Study 1: in both SCT and ST, the main effect of FDI was significant. Field independents outperformed field dependents in fluency, flexibility and novelty.

End of Table 1

Authors (years)	Research design	Statistical analyses	Sample characteristics	Field dependence-independence measures	Creativity measures	Focus on creativity	Findings
	Study 2: between model	Study 2: ANOVA: 2 (FD, FI) × 2 (without cues, with cues).	Study 2: N = 107 (15 M; 92 F). Range = N.D. Mean = 20.23. SD = 1.92.	Study 2: EFT apparatus: I part = 9 items (practice). II part = 10 items (test). III part = 10 items (test). Total items = 29. Scoring: I part = 0 points. II part = 12 points. III part = 12 points. Total score = 24 points. Top 30% (≤ 13.50 points) = FD. Bottom 30% (≥ 17.50) = FI.	Study 2: BTs: 1) SCT parameters: fluency, flexibility and novelty.		Study 2: field independents outperformed field dependents in SCT fluency, flexibility and novelty, confirming the findings of Experiment 1. Moreover, in the absence of environmental cues, the novelty score was higher in field independents than field dependents. In the presence of environmental cues, field dependents and field independents produced equally novel ideas. No significant results have been found for fluency and flexibility.

Notes: AGT = Ask and Guess Test; ANCOVA = analysis of covariance; BT = Brainstorming Task; CAT = Consensual Assessment Technique; CMT = Collage-making task; CITT = Circles Test; DFC = divergent production of figural classes; DSU = divergent production of symbolic units; DET = Decorations Test; EFT = Embedded Figures Test; FD = field dependence; FI = field independence; GEFT = Group Embedded Figures Test; JSF = Jackson Short Form; HFT = Hidden Figure Test; MANOVA = multivariate analysis of variance; PEFT = Preschool Embedded Figures Test; PPMC = Pearson product-moment correlation; PRS = Play Rating Scale; RAT = Remote Associates Test; SC = Spearman's correlation; SCT = science task; ST = social task; TCT = Tin Cans Test; TTCT = Torrance Tests of Creative Thinking; TTCT-F = Torrance Test of Creative Thinking-Figural.

A total of 1145 participants (402 males and 466 females) were enrolled in these eight studies, and the range of participants was from 40 to 300 subjects. The samples' mean age varied from 3 to 32 years. Three studies did not report some socio-demographic information such as gender (Saurenman & Michael, 1980), mean age (Baranovská et al., 2017), and range and mean age (Noppe & Gallagher, 1977; Spotts & Mackler, 1967). One study (Spotts & Mackler, 1967) indicated that the sample was composed of undergraduate students and one study (Noppe & Gallagher, 1977) of education majors. In addition, one study reported only the percentage of gender (Lei et al., 2021). Only one study involved children (Saracho, 1992), one pre-adolescent (Saurenman & Michael, 1980), two adolescents (Baranovská et al., 2017; Lei et al., 2021), three young adults (Miller, 2007; Noppe & Gallagher, 1977; Spotts & Mackler, 1967), whereas one study focused on both adolescents and young adults (Li et al., 2020).

2.3. Instruments and scoring methods

One study evaluated FDI using the Preschool Embedded Figures Test (PEFT) (Saracho, 1992), a test suitable for administration to children between the ages of 3 and 5 years. The PEFT consists of 24 items in which children were requested to find a simple figure embedded in familiar objects. A low number of correct responses reflects the children's predisposition toward field dependence, whereas a high number of correct responses is related to field independence. Two studies evaluated FDI through the EFT (Lei et al., 2021; Li et al., 2020). In Lei's and colleagues' study (Lei et al., 2021), the authors reported only that they used the EFT and categorized participants by T score of the test. Participants with a T score less than 50 were field dependent, whereas participant with a T score above than 50 were categorized as field independent. In Li's and colleagues' study (Li et al., 2020) the EFT consisted of three parts: 1 practice (9 items), 2 tests (10 items for each part), in which participants had to locate and outline a simple figure embedded within complex figures using a pen. The individual predisposition toward field dependence or field independence was evaluated, ranking the correct responses provided by participants from low EFT scores to high EFT scores and selecting the top 30% (field dependent group) and bottom 30% (field independent group) of participants. One study (Spotts & Mackler, 1967) evaluated the FDI by the Jackson Short Form of the EFT, which consisted of one test trial of 12 embedded figures used in the EFT and the HFT, in which participants were requested to find a simple figure within 16 different complex designs. Finally, four studies used the GEFT (Baranovská et al., 2017; Noppe & Gallagher, 1977; Saurenman & Michael, 1980; Miller, 2007), in which subjects were requested to find a shape hidden within a complex geometric design by three sets: one practice set (7 items) and two test sets (9 items for each set).

Regarding creativity, six studies focused on creative process, whereas only two papers evaluated the individual creative production (see Table 1). Concerning creative process measures, one study (Noppe & Gallagher, 1977) used the Remote Associates Test (RAT) (30 items), a convergent tool in which subjects had to associate a word with other three unrelated words. The number of correct responses was used as the accuracy parameter, and no time limit was reported. Five studies used divergent measures. In one study, Spotts and Mackler (1967) evaluated DT by considering the verbal and visual domains. Specifically, the DT verbal domain was assessed by the Ask and Guess Test (AGT), in which the focus was to write about possible

causes and events concerning a tale, the Mother Goose story, in a time limit of fifteen minutes (parameters: fluency, adequacy, and flexibility); and the Tin Cans Test (TCT) in which subjects were requested to find unusual uses of tin cans in five minutes (parameters: flexibility, fluency, and originality). The DT visual domain was evaluated using the Circles Test (CIT) and the Decorations Test (DET). Whereas in the former, subjects were requested to see how many objects they can from 36 circles placed in six different rows in ten minutes (parameters: fluency, flexibility, elaboration, and originality), in the latter, participants had to decorate objects in any way they wished in a time limit of six minutes (parameters: fluency, flexibility, elaboration, and originality). One study (Saurenman & Michael, 1980) used two measures of DT: the divergent production of figural classes (DFC), in which subjects were given information in concrete forms (e.g., capital letters) and were instructed to generate conceptual classes; and the divergent production of symbolic units (DSU), in which participants were given information in the form of denotative signs (letters, numbers, musical notations, codes, and words), and had to generate conceptual units. Two studies used two different subtests of the Torrance Tests of Creative Thinking (TTCT). Specifically, one study (Baranovská et al., 2017) used the CIT of the Torrance Test of Creative Thinking-Figural (TTCT-F), in which participants were requested to use 30 circles in a time limit of ten minutes for drawing anything they wished. The subjects' responses were evaluated in terms of fluency, flexibility, and originality. One study (Lei et al., 2021) used the unique use of cans, in which participants had to list as many unusual uses as possible. No time limit was used. Each unusual use in the list provided by the participants was evaluated in terms of fluency, flexibility, and originality. Finally, Li et al. (2020), in the first experiment, used the scientific task and the social task, in which participants had to independently think of as many ideas as possible and save them in a *Microsoft Word* document. The time limit was fifteen minutes for each task, and ideas were evaluated in terms of fluency, flexibility, and novelty. In the second experiment, the authors used the scientific task only but in two different conditions: without environmental cues (the same condition of the first experiment) and with environmental cues in which participants used a group chat in which they could save, send, and view their own and other's ideas. The same time limit and parameters of the first experiment were used. Regarding creative production measures, one study (Saracho, 1992) used the Play Rating Scale, in which three observers evaluated children's behaviors in terms of creativity in communicating ideas, whereas one study (Miller, 2007) used the Collage-making task, evaluating participants' collages in terms of creativity, according to the consensual assessment technique (Amabile, 1982).

2.4. Findings

Six studies evaluated the relationship between FDI and creative process. Regarding DT, Spotts and Mackler (1967) found that the EFT score negatively correlated to visual DT in terms of originality and elaboration of the CIT and in terms of fluency, flexibility, and originality of the DET. No significant correlations were found in fluency and flexibility of the CIT. In addition, EFT did not significantly correlate with all verbal DT measures. Spotts and Mackler (1967) also found that HFT scores positively correlated with verbal DT: the HFT positively correlated with fluency and flexibility of the AGT and elaboration of the CIT. No significant correlations were found considering the other verbal DT parameters. Positive correlations

were also found between HFT and visual DT in terms of fluency, flexibility, and originality of the DET and in terms of fluency and originality of the TCT. No other significant correlations were found. Considering the logic underpinning the two FDI tests (for EFT, the lower the execution time, the more the individual predisposition toward field independence; for HFT, the more the accuracy score, the more the individual predisposition toward field independence), these findings showed a relevant interplay between field independence and DT. However, in this study, a significant and negative correlation between HFT and originality of the CIT was also found. Partial significant results were found by further studies. For instance, Saurenman and Michael (1980) found only in children with low achievement the interplay between the GEFT and both DFC and DSU. In addition, evaluating visual DT Baranovská and colleagues (Baranovská et al., 2017) found that the GEFT correlated only positively only to the elaboration score of the TTCT-F. The main effect of FDI evaluated by EFT and verbal DT was found in terms of fluency and originality but not in flexibility (Lei et al., 2021). Moreover, field independents outperformed field dependents during brainstorming tasks, including scientific and social tasks, in terms of fluency, flexibility, and novelty (Li et al., 2020), but in the presence of environmental cues field dependent and independent subjects produced equally novel ideas. Only one study evaluated the interplay between FDI and CT, showing a positive correlation between the GEFT and the accuracy score of the RAT (Noppe & Gallagher, 1977).

Regarding creative production, both studies found that field independents were more creative than field dependents (Miller, 2007; Saracho, 1992).

Discussion

This systematic review sought to explore the current literature on the interplay between FDI and creativity through the lens of both creative process and creative product.

Focusing on creative process, the findings appear quite complex because the key role of field independence was confirmed only in some studies (*e.g.*, Lei et al., 2021 in Study 2; Li et al., 2020), whereas in others, negative relationships (*e.g.*, Lei et al., 2021 in Study 1; Spotts & Mackler, 1967) or even no correlations (*e.g.*, Baranovská et al., 2017) were found. Most studies focused on both visual and verbal DT, whereas only one study involved CT (Noppe & Gallagher, 1977). This implies that the role of creative thinking was not fully addressed. In addition, the relationships between FDI and the key parameters of DT (fluency, flexibility, originality, and elaboration) are unclear. Probably this fragmented result is due to the variety of scoring procedures used to assess FDI and DT. For instance, considering FDI scoring, some studies used the median split (*e.g.*, Noppe & Gallagher, 1977), others the t-test (Lei et al., 2021) or the top-bottom 30% (Li et al., 2020) to identify field dependents and field independents. Regarding DT scoring, instead, some studies used empirical scoring (based on the statistical frequencies of each response in the study sample) (*e.g.*, Baranovská et al., 2017; Lei et al., 2021), whereas others rater-based scoring methods (evaluation of independent raters) (Li et al., 2020). Moreover, the interplay between FDI and DT was not sufficiently evaluated in children. For instance, only one study considered the children population (Saurenman & Michael, 1980), revealing the interplay between field independence and DT in children with high achievement only.

Although only two relevant studies were selected regarding creative production, results appear to be more consistent, showing a close relationship between field independence and individual creative production (Miller, 2007; Saracho, 1992). Both studies focused on the “creativity” value for assessing the participants’ ability to generate a creative invention: one study relied on the consensual assessment technique (Miller, 2007), whereas the other one did not (Saracho, 1992). Given these findings, research in this area has demonstrated promising results, but there is much room to develop a deeper understanding of the association between FDI and creative production.

Overall, the picture that emerged from this systematic review is that the FDI-creativity link has been not addressed adequately. First, the most of studies focused on creative process. In addition, some studies used self-report creativity (see Silvia et al., 2012), that is, specific questionnaires or scales aimed to assess everyday creativity, creative achievements, abilities, self-concepts, and so forth. However, although these studies (Fergusson, 1992, 1993) showed that field independents declare to be more creative, they add only a very small contribution to the issue of the relationships between FDI and creativity, being not based on performance tasks.

Limits and future research directions

Although we used the systematic search and review process underpinned by the PRISMA rules, some limitations should be considered: a) the approach to use only published works; b) articles in English; c) the strength of the studies was not analyzed. In addition, limitations inherent in the studies reviewed need to be also acknowledged. Most studies involved a correlational design, whereas only a few studies were based on a between design. In some studies, demographic information was not reported, and the creativity task was not described. Importantly, all studies were not based on a clear theoretical frame in terms of creative process and/or creative production. DT and CT were often confounded with creativity *per se*, even though these measures represent only the individual creative potential.

In the future, it is important to address the association between FDI and creativity using clear theoretical and methodological approaches, mainly in terms of creativity. In this vein, it appears crucial to frame creativity not only within the process or product, but also within a theoretical model reflecting the basic construct under investigation. Notably, a life span perspective, as well as a gender difference perspective, should be better developed, given that age and gender might affect the FDI-creativity link.

Finally, note that social and cultural factors also modulate perceptual disembedding skills (Bagley & Mallick, 1998). For instance, Westerners show a local attentional bias, processing local visual information better and observing the world analytically (Caldara et al., 2010). By contrast, easterners exhibit a global bias, focusing on the context and relations among objects (Lao et al., 2013). Thus, in terms of FDI, it is likely that Westerners are more field-dependent, whereas East people are more field-independent (Yuanxi Lee et al., 2021) with potential implications on creative process and production. Indeed, creativity is modulated to some extent by socio-cultural factors (Palmiero et al., 2017; Wang et al., 2021). Western people tend to report higher elaboration scores (more details) in DT tests (e.g., Palmiero et al., 2017; Saeki et al., 2001) as well as higher novelty (Shao et al., 2019) than Eastern people, who in turn show higher usefulness. This suggests the need to explore the impact of FDI on both creative process and production also in light of potential socio-cultural mediation effects.

Conclusions

Previous research has widely highlighted the pivotal role of cognitive styles in building creativity (e.g., Kozhevnikov et al., 2021). As such, the individual predisposition toward field dependence or field independence should represent one of the main factors involved in both creative process and creative production of actual outcomes. However, our results revealed a surprising scenario: first, the interplay between FDI and creativity seems to be multidimensional rather than a simple linear relationship; second, the analysis of such an association is characterized by a paucity of studies that cover the life span fragmentally. Besides, the reported findings are controversial and challenging to compare. To sum up, further and more accurate empirical explorations to reach consistent results about the role of FDI in creativity for both process and production are needed.

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