DOI: https://doi.org/10.52131/pjhss.2022.1002.0219

Pakistan Journal of Humanities and Social Sciences

olume 10, Number 2, 2022, Pages 546–557
Journal Homepage:
https://journals.internationalrasd.org/index.php/pjhss

Pictorial Databases for the Assessment of Affective Flexibility: A Systematic Review

Rabia Maryam[1], Rabia Khawar[2]

[1] Lecturer/Ph.D. Scholar, Department of Applied Psychology, Government College University, Faisalabad, Pakistan. Email: rabiamaryam@gcuf.edu.pk
[2] Associate professor, Department of Applied Psychology, Government College University, Faisalabad, Pakistan. Email: rabiakhawar@gcuf.edu.pk

ARTICLE INFO

Article History:
Received: January 28, 2022
Revised: May 03, 2022
Accepted: May 11, 2022
Available Online: June 04, 2022

Keywords:
Affective Flexibility
Emotional Flexibility
Self-assessment Manikins
Psychosocial-Adjustments
Functional Outcomes

Funding:
This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

ABSTRACT

The present paper attempted to analyze the existing task-based measures of affective flexibility and to provide a strong database for further development and validation of culturally relevant task-based measures of affective flexibility. The Articles in which affective tasks were developed are included in this review. Only those articles which had been transcribed in English and published in peer-reviewed journals from the year 1995-to 2021, with a sample of youth (15-35 years) were included. Key terms were effective flexibility, emotional flexibility, assessment of affective flexibility, and measures of affective flexibility. A systematic search of multiple computerized databases including Science Direct, Pub Med, Google scholar, and Psyc INFO was accomplished to find out the relevant articles. Both keyword search and citation search was performed for the current review. A total of 116 relevant articles were initially evaluated, 101 of them were excluded due to not meeting the inclusion criteria, and finally, 15 articles were retained. Analysis revealed that utilization, psychometric properties, and measurement accuracy were higher for several databases. Most of the studies have used standardized picture databases as stimulus material using a switching paradigm predominately. Correlation and t-tests were predominately performed for statistical analyses of the data. Strengths, limitations, and implications of the databases for affective flexibility had also been discussed.

Corresponding Author's Email: rabiamaryam@gcuf.edu.pk

1. Introduction

Researchers have been adopting various methods to investigate affective flexibility in laboratory (such as through task-based measures) or in everyday settings (e.g. using self-report measures). These affective flexibility measures may range from video clips, sounds, words, static pictures to simple paper or pencil measures. Whereas, finding an applicable visual database relevant to a specific research question is an even bigger task to handle (Dan-Glauser & Scherer, 2011; Sharma & Bhushan, 2019). As for selecting a relevant database for a specific task, a researcher usually selects one of the two different options: either to generate a culturally relevant database for one's study (a tedious task in itself) or to use any viable database made available by the previous studies. No matter what procedure does one adopts, the collected database has to go through the test of several considerations before being initiated into research for possibly generating the most appropriate, suitable, and reliable findings (Dan-Glauser & Scherer, 2011). The current review is an effort at providing detailed information to researchers about the existing pictorial databases/ measure of affective flexibility.

Affective flexibility (AF) is the flexible involvement and/or non-involvement in emotionally significant sets of events or information (Kraft, Rademacher, Eckart, & Fiebach, 2020). It is the internal state of individual that what and how one thinks and feels regarding

eISSN: 2415-007X

different and competing emotionally charged environmental stimuli. AF is more closely related to cognitive flexibility, (Zhu & Bonanno, 2017) and for a couple of decades, it has been explored through instructed shifts of emotionally charged materials and/or tasks, using experimental paradigms (Genet & Siemer, 2011; Kraft et al., 2020).

When the researchers intend to study affect within a context (i.e. cognitive, behavioral or social context), one of the most important prerequisite for them is the selection of suitable and appropriate stimuli for the induction of a specific affective reaction or emotional state, this stimulus set is called "emotionally charged material" (Gerrards-Hesse, Spies, & Hesse, 1994; Horvat, 2017). Such materials are available in different modalities such as auditory, visual and lexical and have been commonly used to elicit emotion related concepts in behavioral and neuro-physiological studies regarding both clinical and non-clinical populations (Marchewka & Nowicka, 2007; Tang & Posner, 2009).

Despite the availability of multiple modalities for research on affect, the current review presents an assessment only of the pictorial databases based on either dimensional or discrete categories. These databases are selected for review because of their vast utility, easy administration and allocation to participants, and capacity to be edited and recorded (Schaaff & Schultz, 2009). In pictorial databases, complex and meaningful images and/or faces are presented (Lang, Bradley, & Cuthbert, 1997). Moreover, evidences also suggest that even several sets of pictorial databases or parts of different sets can also be used simultaneously to handle specific research questions and design in a single research (Balsamo, Carlucci, Padulo, Perfetti, & Fairfield, 2020).

Emotions have long been discussed in terms of discrete/ categorical and dimensional theories. If emotions are conceptualized in discrete states, they can be explained as diverse sets of physiological, experiential and behavioral factors and can ascribe some specific labels for emotional feelings (such as sadness, happiness, surprise, anger etc.). Whereas, the dimensional viewpoints state that emotional conditions are structured by multiple factors such as approach–avoidance, arousal and/or valance and should be explained in terms of a biphasic manner (Feldman Barrett & Russell, 1998; Watson, Wiese, Vaidya, & Tellegen, 1999).

The basic objective of the current review paper is to systematically discover and synthesize the existing literature on affective flexibility so as to facilitate contemporary researchers to select an appropriate database relevant to particular research question and population. However, in the presence of vast literature on the topic, the current review is selective and confined only to the following research questions. The Research Questions are (1) How do emotion-evocative picture stimuli measure affective flexibility of adults? (2) What should be the most used and appropriate response system (dimensional or discrete) for affective picture stimuli?

The current systematic review follows the PRISMA reporting guidelines by Moher et al. (2015) PRISMA stands for "Preferred Reported Items for Systematic Reviews and Meta-analysis. It is basically a check list and the essential points of a systematic review and meta-analysis are checked against it. It consists on PRISMA Flow Chart/diagram and PRISMA Protocols/checklist. Flow chart/diagram is used for describing the screening process of materials for any systematic review *(*see *figure* 1) and explains the transparency of selection process by making all the steps obvious. Whereas PRISMA checklist helps authors to keep on track and improve the reporting of a systematic review or meta-analysis. The PRISMA 2020 statement has replaced the 2009 statement and includes new reporting guidance (Page et al., 2021).

The method section of the current review presents the methodology of the systematic review according to the standardized guidelines such as literature search, study selection, data extraction and synthesis. However, the result section presents the outcomes; which include sample characteristics, stimulus material and theoretical ground of the included studies. Moreover, picture quality and accessibility of the picture data set is also discussed.

3. Method

3.1 Protocol and Registration

For the current systematic review, protocols were not registered

3.2 Search Strategy

In the light of the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines by Moher et al. (2015), a search of multiple computerized data bases including PubMed, PsycINFO, Science Direct and Google scholar was performed between July to September 2021 to identify the relevant articles. Both key word search and citation search were performed for the current review. Key terms were affective flexibility, emotional flexibility, assessment of affective flexibility and measures of affective flexibility. Resulting studies were screened out and only peer reviewed articles, published from 1995 to 2021 were included in the current review. After that we again scrutinized the studies on the basis of inclusion criteria.

3.3 Study Selection

Followed by the PRISMA guidelines, studies were se selected by both of the researchers independently. First of all relevant searches were conducted to identify background literature on the topic, search terms and inclusion criteria for the researches were also identified at this stage. After fulfilling initial parameters, the literature was searched based on key terms and initially just titles and abstracts were reviewed. Full text articles were obtained for the studies which passed from the initial screening. Finally relevant literature was assessed for its quality, theoretical grounds, implications and findings. At every stage of the study selection, synthesis and inclusion of the study in the current review, the agreement of both of the researchers was obtained. In the final stage all the extracted literature was tried to sum up in a nutshell.

3.4 Inclusion Criteria

Articles which included affective flexibility task development based on pictorial dataset, with a sample of youth (15-35 years), written in English language and published in peer reviewed journals from year 1995-2021 were included in the present review, as mentioned in *Table I*.

3.5 Selection Process

Both of the authors independently reviewed each article to scrutinize whether it meets the inclusion criteria or not. Parameters for selection of the articles are described in *Table I*. However, articles were manually selected and none of the automatic device was used for the selection of articles.

3.6 Data Extraction and Synthesis

The following information was sought out from the extracted studies: aim(s) and objectives, design, population, measures included, procedure and findings. Researches based on qualitative research design and non-empirical theoretical work also excluded because they are out of scope from the current review.

Table 1: Inclusion Criteria

Criteria	Included Articles
Type of articles	Peer-reviewed papers only
Date published	Between 1995 and 2021
Assessment Procedure	task development of Affective Flexibility
Participants' age	18-35 years
Language	English
Study type	Empirical and Quantitative
Stimulus material	Databases which used only static pictures as their stimulus material were included in the review
Important parameters	Focused on the assessment procedures and current databases of affective flexibility

4. Results

4.1 Study Characteristics

After the rigorous procedure mentioned in the method section and summarized in *Figure 1*, total 15 studies were selected for the current review. The major characteristics of the studies included in the current review are summarized in *Table II*. Most of the studies included in the review were performed in the current decade. All the included studies had developed the

picture database for the assessment of affective flexibility. Rating of the picture databases by the included studies was done through Self-Assessment Manikins (SAM). Only 3 of the included studies used paper and pencil version of SAM rating, while all the other studies used computer-based SAM ratings of the picture.

4.2 Sample Characteristics

As summarized in *Table II*, Studies in the current review included participants from the late adolescents and early adulthood group because of the exclusion of studies from the review where participants belonged to below or above that specific age. In all studies, student population is used because of suitability of the sample and easy accessibility for the task performance. Moreover, student population can be motivated to produce genuine responses through giving course credit and such type of other rewards. Total number of participants reported in all of the fifteen studies mentioned in *Table 2*, is N=4225. As for as the study wise minimum and maximum sample size is concerned, Dan-Glauser and Scherer (2011) generated The Geneva affective picture database (GAPED) with minimum sample size n=60, whereas (Weierich, Kleshchova, Rieder, Reilly, & Vazire, 2019) developed The Complex Affective Scene Set (COMPASS) on n=847 students which is the maximum sample size for a task based study.

4.3 Theoretical Grounds and Response Systems

Szymanska et al. (2015) developed The Besançon Affective Picture Set-Adult (BAPS-Adult) based on attachment theory and adopted both dimensional and discrete approaches to elicit responses from the participants. The reappraisal theory of emotions had provided the basic ground for Dan-Glauser and Scherer (2011) who developed a database named as The Geneva affective picture database (GAPED). On the other hand, Balsamo et al. (2020) provided validation of the existing databases and is independent of any theoretical ground.

As Mauss and Robinson (2009) states that several available evidences supports the notion that emotional flexibility measures reflect dimensional states rather than discrete one. Studies reported in the current review by Goodman, Katz, and Dretsch (2016); Kurdi, Lozano, and Banaji (2017); Marchewka, Żurawski, Jednoróg, and Grabowska (2014); Rahman and Reza (2017) go in line with the above findings and purely based on dimensional rating of emotions. Though Moyal, Henik, and Anholt (2018) provided their database named as Categorized Affective Pictures Database (CAP-D) and attempted to generate categorization of the pictorial data sets developed by Marchewka et al. (2014) and Dan-Glauser and Scherer (2011) named as The Nencki Affective System (NAPS) and (GAPED) respectively, yet original dimensional approach for the rating of these data bases is more suitable and wildly used approach. However, Mikels et al. (2005); Moyal et al. (2018) and Sharma and Bhushan (2019) used discrete categorization of emotions as their response systems. Whereas, Kim et al. (2018) and Weierich et al. (2019) developed Image Stimuli for Emotion Elicitation (ISEE) and The Complex Affective Scene Set (COMPASS) respectively and adopted both dimensional and discrete approaches as their response systems.

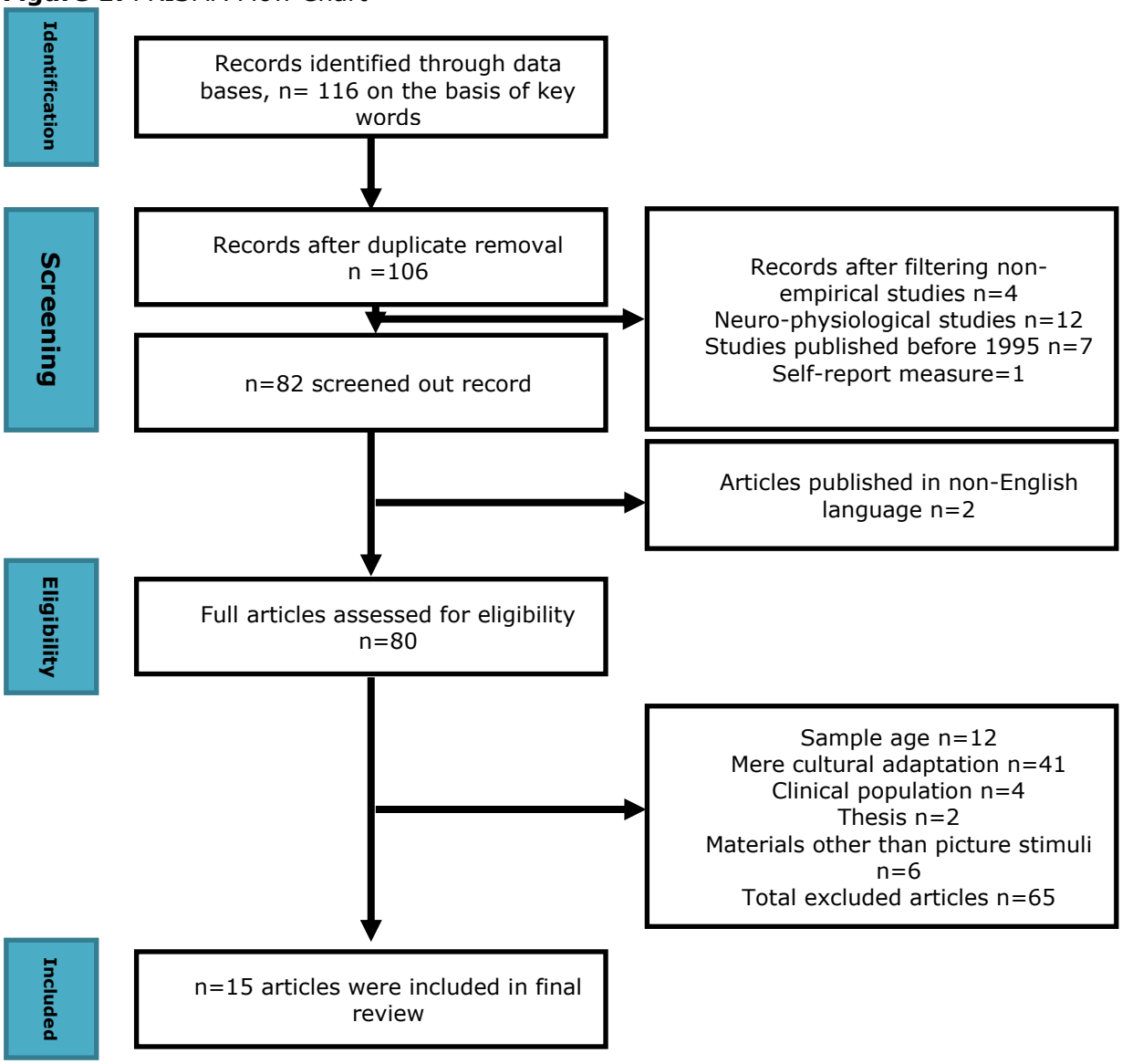
4.4 Picture Quality

Several studies have approved the point that the picture quality (such as size, complexity and luminance) has impact on the processing of affective pictorial stimuli (Bradley & Lang, 2007). Keeping this in view, high quality photographs with standard size and luminance were developed by Marchewka et al. (2014) in their data base named as (NAPS) rather than any other database reported in the current review.

4.5 Accessibility

Data bases of Marchewka et al. (2014) & Kurdi et al. (2017) labeled as (NAPS) and (OASIS) respectively are freely assessable to professionals and students for non-commercial research purposes. Whereas the database presented by Goodman et al. (2016) named as Military affective Picture System (MAPS) is assessable only for the studies on military professionals. Indian and Malaysian data bases by Sharma and Bhushan (2019) and Rahman and Reza (2017) respectively, are also available and can be taken according to cultural relevance.

Figure 1: PRISMA Flow Chart



Note: Electronic searches identified 116 articles based on keyword search. Articles were screened out on several parameters and only 80 papers were securitized. Full text n=80 articles were obtained and only 15 articles meet the eligibility criteria of the current review.

Table 1: Summary of Main Characteristics of Included Studies Sorted from the latest to Oldest

Author	Aim and objective	Population	Measures	Procedure	Findings
Balsamo et al. (2020)	To validate existing sets of affective stimuli	N= 199 young adults (166 females) mean age =21.28 years *SD* = 4.47; range: 19–27)	Self-report Measures: • The Culture Fair Intelligence Test (CFIT) • State Trait Inventory of Cognitive and Somatic Anxiety" (STICSA) for mood • The "Trait Depression Inventory" (TDI) • The short "Big Five Questionnaire" Task: Images were selected from IAPS, NAPS and GAPED **(180, 180 and 168 respectively)**	Participants were divided into three groups and each group performed on the same task on three different sets of affective stimuli named as IAPS, NAPS and GAPED	The study provided validation for the existing databases independent for any discrete or dimensional category.

Kraft et al. (2020)	To find out flexible shifting on affective material, a new paradigm combining cognitive and affective flexibility was developed	N=100 (ranging from 18–35 years) Average age of participants was 23.7 years ± 3.8,	• Cognitive Flexibility task • Affective Flexibility Task • Neutral task • Feed-back based flexibility Tasks • Total 120 pictures of persons, (60 males and 60 females) were used as stimulus set, pictures were drawn from FACES and were used twice resulting in 240 pictures	Each experimental contains three paradigms and all of the respondents have to o trough each situation. All the paradigms were presented in a counterbalanced order	It was concluded that cue dependent flexibility and response time switch costs was associated with one another, on the other hand, feedback-based flexibility was to be less related with other types.
Sharma and Bhushan (2019)	To develop a culturally relevant stimuli for emotion recognition and affective flexibility	N= 350 undergraduates Within subject design	140 colored pictures (captured from different angels with the same background)	Colored pictures of 6 basic and a neutral emotion were developed. To make the expression heterogeneous but culturally relevant, four expressers (with equal representation of both genders) from the same culture were taken with average age of 25 years	Due to the inclusion of pictures from multiple angels and maintenance of strict criteria, the current database can be utilized in affect relevant studies, particularly in the Indian cultural context.
Szymanska et al. (2015)	To create a new set of visual stimuli for attachment related emotions based on attachment theory	N= 315 participants with mean of 20.9 ± 3 years	Total two hundred and seventy six pictures were collected through free online databases, whereas only four of them were taken from IAPS	To cover up the chances of cognitive overload and to make the rating procedure brief, the overall database was equally distributed into three sets with each type of pictures (comfort, neutral, distress and complicity	*The Besançon Affective Picture Set-Adult (BAPS-Adult)* is a new stimulus set, allowing participants to select from a vast collection of attachment based pictures
Weierich et al. (2019)	To add on pictures related to visual complexity and to incorporate social content among affect categories, a new dataset is required	**N=** 847 students mean age 20	Non-copyrighted images on the internet and photographs taken by lab member (images having complex scene with multiple focal points are selected and having single objects are excluded), and total 300 pictures were included in the final set	Stimulus selection and norming was done through four phases: First three phases were development phases and fourth phase was done for standardization and norming E-prime software was used for the execution of experiments	*The Complex Affective Scene Set (COMPASS)* is a new set containing 300 pictures especially showing social outcomes and natural affective scenes.
Kim et al. (2018)	To upgrade previous approaches of stimulus selection and validation and to develop a new systematic picture database	N= 179 with the age range of 18-30, while mean age was 19 years and SD= 1.7 years	10696 images were initially selected through image crawling method	Research participants evaluated the entire pictures with three points 1. Dimensional scale ratings 2. Selecting the categories of emotions and 3. The personal liking and disliking for each presented picture	In *Image Stimuli for Emotion Elicitation (ISEE),* images were selected using a computing method rather than experimenters to reduce the selection bias. Moreover due to the establishment of retest reliability, images can be used especially in longitudinal studies. The strengths of ISEE were the use of computer based approaches for the selection of pictures and for rating as well. Moreover, retest reliability also provide strong statistical grounds for the database.
Moyal et al. (2018)	Aimed to generate a pictorial database that categories affective pictures on discrete levels of emotions	**N= 15** clinical Psychologists (as experts for pre-test phase) with the mean age of 30 ± 4.35 years N=204 For both of the experiments	Pretest and Experiment 1a: 1513 pictures were selected from IAPS, NAPS, GAPED, Berkeley Segmentation Dataset and Benchmark. experiments EXPERIMENT-1 b and EXPERIMENT 2 **Material:** 513 pic from pre-test and experiment 1a and 13 from IAPS, **total 526 pictures**	Six sessions of experiments were done with each group of participants with one week interval. During each session almost 85 pictures were presented in a random order. Sessions were executed in a counterbalanced order	*Categorized Affective Pictures Database (CAP-D)* is the data base which categories emotion relevant pictures in accordance with the mutual consensus of the participants.
Rahman and Reza (2017)	To develop a new set of affective picture stimulus material with Malaysian population	N=72 adults This research used cross-sectional design, random groups and purposive sampling technique	Total 186 pictures (83pictures from IAPS) 83 pictures selected from internet) Rating of affective picture was done through the paper and pencil version of Self-Assessment Manikin based on dominance, valance and arousal	Picture set was presented to each participant in a random order and they have to rate each picture on all the three scales of dominance, valance and arousal	Findings documented that the study provided an additional database among Malaysian population. The results also highlighted that the SAM is capable for rating the affective pictures with Malaysian population.

Kurdi et al. (2017)	To develop an easily accessible, online data set for affective research with corresponding normative affective rating.	N= 822 Based on Circumplex model of emotion	Different online sources were consulted to generate total 900 pictures which were included in this study Rating were done on the basis of valance and arousal	Both of the sets of instructions and rating dimensions were randomly distributed to the participants	*The Open affective Standardized Image Set (OASIS)* is free and easily accessible picture database in which emotional dimensions were established with a large number of novel images containing four emotions.
Goodman et al. (2016)	To fulfill the strong demand of emotional material for military population, a new set of military related images using males and females military and civilian participants was developed	n= 201 military and n= 176 civilians, and a separate sample on n= 176 were recruited N= 553	240 pictures reflecting common military related images.	To develop 240 images gender based normative rating was collected from American army officials and civilian population	In *Military affective Picture System (MAPS)* there was a significant gender difference on dominance and valance for both of the sample as military population regardless of their gender reported higher valance. Whereas females from non-military population reveled a significant correlation for arousal and valance.
Marchewka et al. (2014)	To generate an affective stimulus set with accurate physical properties of each picture	N=204 Average age of participants was 23.9 ± 3.4 years	The stimulus set contains the pictures taken from coauthors and from newspapers. Initially five thousand pictures were obtained and finally 1356 were selected	The dimensions of approach-avoidance, valance and arousal were used to rate the pictures on a computerized scale. Physical qualities of the pictures were also reported on the basis of entropy, luminance and contrast	*The Nencki Affective System (NAPS)* give opportunity to the researchers to choose a picture data set related to their research question. It's a freely accessible data set available to the scientific community for noncommercial use
Malooly, Genet, and Siemer (2013)	To develop a data base which find out individual differences in the successful reappraisal of emotions related to negative pictures and in affective flexibility	N=165 ethnically diverse sample with the age range of 17-25	Baseline mood, fatigue and confusion or anxiety were checked through ratings on 1-5 scales The Big Five Inventory Emotion-regulation follow-up questions. Affective flexibility Cognitive flexibility	Participants have to categorize affective pictures on the basis of cues. Combination of pictures was changed according to the random sequences. The cognitive task required that the participants have to switch between affective and non-affective models regardless of the initial categorization	It was first study to find out the flexible processing of affective, emotionally evocative stimuli. Furthermore, it was the first study to check the relationship between an affective processes as well as directed cognitive reappraisal, ensuring that participants were both regulating their emotions and using this particular strategy.
Dan-Glauser and Scherer (2011)	To develop a new set of emotional database (particularly in negative emotional categories) in the field of affective research	N=60 Average age of participants was 24 years (SD = 5.9)	Negative Emotions: Pictures of spiders snakes, focusing on Human right violation and animal mistreatment were selected from existing database Neutral images: Buildings and furniture Positive images: Human and animal babies Nature and landscapes Total **6 categories** and almost **100 pictures** for each category	Pictures were presented in a semi randomized order to each of the 5 groups containing 12 participants. They have to rate each picture for 1 rating scale of valance, 2 for arousal and 2 for acceptance of norms on a0-100 points rating scales	In *The Geneva affective picture database (GAPED)* a new dataset of affective stimuli containing seven hundred and thirty pictures based on reappraisal theory of emotions was developed
Mikels et al. (2005)	To generate categorical and descriptive ratings of the data set developed by International Affective Picture System (IAPS).	Sample for pilot: n=20 (with equal number of female and male participants) mean age=19.55 Study 1: n=60 students average age = 18.7 years with equal proportion of male and female students **Study 2:** n=60 mean age=18.8	Pictures were selected from IAPS. Total number of pictures showing positive and negative valance was 187 and 203 respectively	First of all pilot study was conducted to determine the overall category of emotions then subsets of images depicting positive and negative valance were selected respectively to generate a valid category label	The data set provided for IAPS database, regardless of the gender differences

Lang et al. (1997)	To develop a vast data set containing emotionally charged colored stimulus material based on dimensional theories of emotions	Male and female college students participated as part of a course requirement.	Colored pictures with clear cut figure ground relationship were selected on the basis of entire emotional domains.	Both paper pencil and computer based versions of self-assessment manikins were used to acquire affective rating for different picture sets. The dimensions of dominance, arousal and valance are extracted	International Affective Picture System *(IAPS)* was the first dataset for affective research with dimensional ratings of emotions was developed

5. Discussion

The ability to react in a situation specific affective style and to change the emotional reaction according to the situational demands is called affective flexibility (Beshai, Prentice, & Huang, 2018). The construct of affective flexibility has been studied mostly with experimental paradigms using affective and/or neutral stimulus material (Genet & Siemer, 2011; Kraft et al., 2020; Malooly et al., 2013). Due to the extensive available researches relevant to the research questions of the current review, we discriminately searched for the literature which may be potentially the part of this review. To limit the scope of the review, studies involving children, adolescents, older adults and clinical population were excluded from the current review. Moreover, we focused only on internal emotional states and affect related traits such as neuroticism, emotional expressiveness and extraversion were not included in the review (Bonanno & Burton, 2013; Rusting, 1998). Moreover, only empirical studies were our focus of interest published in a specific time frame from 1995-2021. Finally, we focused only on task-based measures of affective flexibility which developed and used pictorial datasets only.

Lang et al. (1997) are the pioneers to develop and normalized a set of standardized images. In the preceding years their dataset is considered as the hallmark in experimental researches regarding multiple research questions. After their emotional relevant databases many researchers have done tedious work on emotions and emotional relevant databases. By closely examining all the studies in this review, we find that though all measures are tailored for the assessment of the same construct, several studies are difference in their approach, theoretical grounds, response format and implications. The variations of multiple measures of emotion have the following significant reason. First, the concept of emotion is a very vast construct which is difficult to capture with only a single measure. So keeping this in view, in the current review (Balsamo et al., 2020; Dan-Glauser & Scherer, 2011; Kraft et al., 2020; Malooly et al., 2013) paired picture stimuli for affective flexibility with the tasks to measure cognitive functioning, personality measures and other self-report outcome measures. Riegel et al. (2016) provides discrete picture based data on affective material so their database is used in the studies where discrete categorical approach of emotions is to be considered. However, they also compare discrete and dimensional approach on emotional picture sets which provides more accuracy in terms of findings and applications..In short, it can be said if the more the affective flexibility measures are tailored for particular research questions, the more valid and reliable findings they will generate (Riegel et al., 2016).

There are certain self –report measures which assesses the construct of affective flexibility such as self-report by Fu, Chow, Li, and Cong (2018) on affective flexibility is valid in this sense that it is related to currently experienced emotions. Generally speaking, self-report measures are easily administered and comprehensive measures of affective flexibility. But there are certain limitations to administer self-report measures for such type of constructs (such as ignorance of one's own affective state and inability to explain slight changes in affect due to situational variations and failure to report brief emotional states). Due to these limitations, either task based measures or the combination of both self- report and task based measures are more suitable choices for affective flexibility

While talking about task based measures of affective flexibility, emotions have been discussed in terms of discrete/ categorical and dimensional theories. The Dimensional viewpoints state that emotional conditions are structured by multiple factors such as approach–avoidance, arousal, dominance and/or valance (Feldman Barrett & Russell, 1998; Watson et al., 1999). On the other hand, theories of discrete emotions explain each emotion in terms of physiological, experiential and behavioral factors. Psychologists have argued that emotional categories such as happiness, disgust and anger and many others emerged from the dimensional elements of emotions along with the cognitive understanding of the self and others (Harmon-Jones, Harmon-Jones, & Summerell, 2017). Emotional dimensions explain

emotions as a global feature shared by others whereas discrete/ categorical aspects of emotions enables us to understand the varieties of dimensional emotional categories (Lench, Flores, & Bench, 2011; Panksepp, 2004). In the current systematic review, we scrutinized both dimensional as well as discrete viewpoints.

There is a disagreement among the researchers about the ratings of affective flexibility and even on the assessment of those ratings. For example some historical but currently functioning viewpoints report that there is an inverse relationship between negative and positive emotions (Watson et al., 1999). On the other hand, some researchers claim that both of these types of emotions have no relationship with each other (Feldman Barrett & Russell, 1998). While some researcher concluded that the relationship of avoidance and approach is similar to that of the positive and negative emotional states, respectively (Watson et al., 1999). Generally speaking, current review highlighted that the different task based measures of affective flexibility used diverse ratings of emotion according to the design of the study and nature of the research question(s). By reviewing all the fifteen articles, we have concluded that dimensional framework is predominately used approach in most of the studies; the reason might be that it explains affect in more diverse and understandable domains rather than mere categorization of emotional pictures into different labels. Whereas, some other studies mentioned in the current review have combined both of the discrete and dimensional perspectives which are in line with Keltner and Haidt (1999) and Smith and Ellsworth (1985) who stated that dimensional and discrete perspectives can be possibly reconciled to a certain degree and explains that every discrete emotion displays a blend of multiple dimensions. On the other hand, few of them have opted discrete emotional categories as their theoretical background and response format. To sum up, we can claim that affect can be explained in terms of dimensions (valence, approach – avoidance, arousal, dominance and motivational direction) or they may also be described as categories (sadness, happiness, disgust etc). Both of the perspectives are merely theoretical assumptions that may ultimately be inadequate. The most important thing regarding both of the perspectives is that which perspective generates most sound scientific evidence and this will determine the worth of each of the perspective.

6. Conclusion

The review described and explained different existing ways of assessing affective flexibility in an informative and organized manner. We concluded that measures of affective flexibility predominately grouped on dimensional (e.g. arousal and valance etc) approach rather than categorical one (e.g. disgust, anger, sadness, fear etc). Moreover, almost all of the measures of affective flexibility are tailor made according to their research question (s), methodology, and other related factors of affective flexibility (executive functioning, cognitive control and personality factors etc). So there is no hard and fast rule to measure affective flexibility and other related constructs. This means that there is no "thing" that measure affect, rather that affect can be measured by multiple, individually variable processes according to the specific research question(s).

Due to the theoretical nature of the paper, the limitations are only confined to some methodological aspects. We have to exclude some methodologically relevant studies due to not meeting the inclusion criteria such as participants' age, study design or publication year etc. One of the major criticisms on any systematic review is the publication bias (Torgerson, 2006). Usually the studies with statistically significant results are published and while doing systematic review, such studies with highly significant results are available to be included in the review. Furthermore, some specific key words and/or some comprehensive questions may restrict the scope of any systematic review. Despite this limitation, we specified key words and form some precise questions because both key words and specific research questions are the important features of systematic review (Hannes, Claes, & Group, 2007). Moreover, the current review is limited only to the pictorial data bases of affective flexibility however the subsequent researches can work on auditory, visual or lexical databases. The studies which used children and elderly sample may also be explored in the future.

Disclosure and Conflicts of Interest

None of the authors have received any financial support for the current work. Moreover, there is no conflict of interest that may affect the current review in any way.

References

Balsamo, M., Carlucci, L., Padulo, C., Perfetti, B., & Fairfield, B. (2020). A Bottom-Up Validation of the IAPS, GAPED, and NAPS Affective Picture Databases: Differential Effects on Behavioral Performance. *Frontiers in Psychology, 11*, 2187. doi:https://doi.org/10.3389/fpsyg.2020.02187

Beshai, S., Prentice, J. L., & Huang, V. (2018). Building blocks of emotional flexibility: Trait mindfulness and self-compassion are associated with positive and negative mood shifts. *Mindfulness, 9*(3), 939-948. doi:https://doi.org/10.1007/s12671-017-0833-8

Bonanno, G. A., & Burton, C. L. (2013). Regulatory flexibility: An individual differences perspective on coping and emotion regulation. *Perspectives on psychological science, 8*(6), 591-612. doi:https://doi.org/10.1177/1745691613504116

Bradley, M. M., & Lang, P. J. (2007). Emotion and motivation. In J. T. Cacioppo, L. G. Tassinary, & G. G. Berntson (Eds.), *Handbook of psychophysiology* (pp. 581-607). UK: Cambridge University Press.

Dan-Glauser, E. S., & Scherer, K. R. (2011). The Geneva affective picture database (GAPED): a new 730-picture database focusing on valence and normative significance. *Behavior research methods, 43*(2), 468-477. doi:https://doi.org/10.3758/s13428-011-0064-1

Feldman Barrett, L., & Russell, J. A. (1998). Independence and bipolarity in the structure of current affect. *Journal of personality and social psychology, 74*(4), 967-984. doi:https://doi.org/10.1037/0022-3514.74.4.967

Fu, F., Chow, A., Li, J., & Cong, Z. (2018). Emotional flexibility: Development and application of a scale in adolescent earthquake survivors. *Psychological trauma: theory, research, practice, and policy, 10*(2), 246-252. doi:https://doi.org/10.1037/tra0000278

Genet, J. J., & Siemer, M. (2011). Flexible control in processing affective and non-affective material predicts individual differences in trait resilience. *Cognition and emotion, 25*(2), 380-388. doi:https://doi.org/10.1080/02699931.2010.491647

Gerrards-Hesse, A., Spies, K., & Hesse, F. W. (1994). Experimental inductions of emotional states and their effectiveness: A review. *British journal of psychology, 85*(1), 55-78. doi:https://doi.org/10.1111/j.2044-8295.1994.tb02508.x

Goodman, A. M., Katz, J. S., & Dretsch, M. N. (2016). Military Affective Picture System (MAPS): A new emotion-based stimuli set for assessing emotional processing in military populations. *Journal of behavior therapy and experimental psychiatry, 50*, 152-161. doi:https://doi.org/10.1016/j.jbtep.2015.07.006

Hannes, K., Claes, L., & Group, B. C. (2007). Learn to read and write systematic reviews: the Belgian Campbell Group. *Research on Social Work Practice, 17*(6), 748-753. doi:https://doi.org/10.1177/1049731507303106

Harmon-Jones, E., Harmon-Jones, C., & Summerell, E. (2017). On the importance of both dimensional and discrete models of emotion. *Behavioral sciences, 7*(4), 66. doi:https://doi.org/10.3390/bs7040066

Horvat, M. (2017). *A brief overview of affective multimedia databases.* Paper presented at the Central European Conference on Information and Intelligent Systems.

Keltner, D., & Haidt, J. (1999). Social functions of emotions at four levels of analysis. *Cognition & Emotion, 13*(5), 505-521. doi:https://doi.org/10.1080/026999399379168

Kim, H., Lu, X., Costa, M., Kandemir, B., Adams Jr, R. B., Li, J., . . . Newman, M. G. (2018). Development and validation of Image Stimuli for Emotion Elicitation (ISEE): A novel affective pictorial system with test-retest repeatability. *Psychiatry research, 261*, 414-420. doi:https://doi.org/10.1016/j.psychres.2017.12.068

Kraft, D., Rademacher, L., Eckart, C., & Fiebach, C. J. (2020). Cognitive, affective, and feedback-based flexibility–disentangling shared and different aspects of three facets of psychological flexibility. *Journal of cognition, 3*(1), 21. doi:https://doi.org/10.5334/joc.120

Kurdi, B., Lozano, S., & Banaji, M. R. (2017). Introducing the open affective standardized image set (OASIS). *Behavior research methods, 49*(2), 457-470. doi:https://doi.org/10.3758/s13428-016-0715-3

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1997). International affective picture system (IAPS): Technical manual and affective ratings. *NIMH Center for the Study of Emotion and Attention, 1*(3), 39-58.

Lench, H. C., Flores, S. A., & Bench, S. W. (2011). Discrete emotions predict changes in cognition, judgment, experience, behavior, and physiology: a meta-analysis of

experimental emotion elicitations. *Psychological bulletin, 137*(5), 834-855. doi:https://doi.org/10.1037/a0024244
Malooly, A. M., Genet, J. J., & Siemer, M. (2013). Individual differences in reappraisal effectiveness: the role of affective flexibility. *Emotion, 13*(2), 302-313. doi:https://doi.org/10.1037/a0029980
Marchewka, A., & Nowicka, A. (2007). Emotionally negative stimuli are resistant to repetition priming. *Acta Neurobiologiae Experimentalis, 67*(1), 83-92.
Marchewka, A., Żurawski, Ł., Jednoróg, K., & Grabowska, A. (2014). The Nencki Affective Picture System (NAPS): Introduction to a novel, standardized, wide-range, high-quality, realistic picture database. *Behavior research methods, 46*(2), 596-610. doi:https://doi.org/10.3758/s13428-013-0379-1
Mauss, I. B., & Robinson, M. D. (2009). Measures of emotion: A review. *Cognition and emotion, 23*(2), 209-237. doi:https://doi.org/10.1080/02699930802204677
Mikels, J. A., Fredrickson, B. L., Larkin, G. R., Lindberg, C. M., Maglio, S. J., & Reuter-Lorenz, P. A. (2005). Emotional category data on images from the International Affective Picture System. *Behavior research methods, 37*(4), 626-630. doi:https://doi.org/10.3758/BF03192732
Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., . . . Stewart, L. A. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic reviews, 4*(1), 1-9. doi:https://doi.org/10.1186/2046-4053-4-1
Moyal, N., Henik, A., & Anholt, G. E. (2018). Categorized affective pictures database (CAP-D). *Journal of cognition, 1*(1), 41. doi:https://doi.org/10.5334/joc.47
Page, M. J., Moher, D., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., . . . Brennan, S. E. (2021). PRISMA 2020 explanation and elaboration: updated guidance and exemplars for reporting systematic reviews. *Bmj, 372*, 71. doi: https://doi.org/10.1136/bmj.n160
Panksepp, J. (2004). *Affective neuroscience: The foundations of human and animal emotions*. New York, USA: Oxford university press.
Rahman, N. A., & Reza, F. (2017). Rating of Affective Pictures of Low and High Arousal Domain among Malaysian Population. *International Journal of Academic Research in Business and Social Sciences, 7*(10), 507-518. doi:https://doi.org/10.6007/IJARBSS/v7-i10/3397
Riegel, M., Żurawski, Ł., Wierzba, M., Moslehi, A., Klocek, Ł., Horvat, M., . . . Marchewka, A. (2016). Characterization of the Nencki Affective Picture System by discrete emotional categories (NAPS BE). *Behavior research methods, 48*(2), 600-612. doi:https://doi.org/10.3758/s13428-015-0620-1
Rusting, C. L. (1998). Personality, mood, and cognitive processing of emotional information: three conceptual frameworks. *Psychological bulletin, 124*(2), 165-196. doi:https://doi.org/10.1037/0033-2909.124.2.165
Schaaff, K., & Schultz, T. (2009). *Towards emotion recognition from electroencephalographic signals.* Paper presented at the 2009 3rd international conference on affective computing and intelligent interaction and workshops.
Sharma, U., & Bhushan, B. (2019). Development and validation of Indian Affective Picture Database. *International Journal of Psychology, 54*(4), 462-467. doi:https://doi.org/10.1002/ijop.12471
Smith, C. A., & Ellsworth, P. C. (1985). Patterns of cognitive appraisal in emotion. *Journal of personality and social psychology, 48*(4), 813-838.
Szymanska, M., Monnin, J., Noiret, N., Tio, G., Galdon, L., Laurent, E., . . . Vulliez-Coady, L. (2015). The Besançon affective picture Set-Adolescents (the BAPS-Ado): development and validation. *Psychiatry research, 228*(3), 576-584. doi:https://doi.org/10.1016/j.psychres.2015.04.055
Tang, Y.-Y., & Posner, M. I. (2009). Attention training and attention state training. *Trends in cognitive sciences, 13*(5), 222-227. doi:https://doi.org/10.1016/j.tics.2009.01.009
Torgerson, C. J. (2006). Publication BIAS: The Achilles'Heel OF Systematic Reviews? *British Journal of Educational Studies, 54*(1), 89-102. doi:https://doi.org/10.1111/j.1467-8527.2006.00332.x
Watson, D., Wiese, D., Vaidya, J., & Tellegen, A. (1999). The two general activation systems of affect: Structural findings, evolutionary considerations, and psychobiological evidence. *Journal of personality and social psychology, 76*(5), 820-838.

Weierich, M. R., Kleshchova, O., Rieder, J. K., Reilly, D. M., & Vazire, S. (2019). The complex affective scene set (COMPASS): Solving the social content problem in affective visual stimulus sets. *Collabra: Psychology, 5*(1), 53. doi:https://doi.org/10.1525/collabra.256

Zhu, Z., & Bonanno, G. A. (2017). Affective flexibility: Relations to expressive flexibility, feedback, and depression. *Clinical Psychological Science, 5*(6), 930-942. doi:https://doi.org/10.1177/2167702617717337