A Systematic Review of Dog-Assisted Therapy in Children with Behavioural and Developmental Disorders

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Abstract

Objectives Animal-assisted therapy with dogs is regularly used in children with behavioural and developmental disorders. Aims of this systematic review were threefold: to analyse the methodological quality of studies on dog-assisted therapy (DAT) for children with behavioural and developmental disorders, to determine to which extent the studies on DAT adhere to the quality criteria developed by the International Association of Human Animal Interaction Organisation (IAHAIO) and to describe the characteristics of the participants, the intervention and the outcomes.

Method Three databases (i.e. *PsycInfo*, *MedLine* and *Eric*) were searched, and 14 studies on DAT were included. The Joanna Briggs Institute checklist (JBIC) and the quality criteria developed by the IAHAIO were used during data extraction. Characteristics of the participants, the intervention, the therapy dogs and the outcomes of the studies were summarised.

Results Six of the 14 included studies reported significant outcomes of DAT, whereof six in the social domain and two in the psychological domain. However, scores on the JBIC indicated low to moderate methodological quality and only three of the included studies adhered to the IAHAIO quality criteria.

Conclusions DAT is a promising intervention for children with behavioural and developmental disorders, especially for children with autism spectrum disorder. A clear description of the therapy's components, the role of the therapy dog and analysis of the treatment integrity and procedural fidelity would improve the methodological quality of the studies and the field of dog-assisted interventions.

Keywords Animal-assisted therapy · Dog-assisted therapy · Children · Behavioural and developmental disorders · Review

The growing body of literature indicates that animal-assisted therapy (AAT) with dogs is a promising intervention for children with different types of behavioural and developmental disorders (Hoagwood et al., 2016; Schuck et al., 2018). In AAT, an animal is present during a therapeutic

intervention together with the client and the therapist, and it is used to improve the social skills of the client, to reduce psychological symptoms and/or to promote neurobiological processes (Gut et al., 2018; Jegatheesan et al., 2018). Given their ability to adapt to human behaviour, read and react to human (body) language, availability and trainability, dogs are one of the most common animals used in AAT (Duranton & Gaunet, 2018; Glenk, 2017; Miklósi & Topál, 2013). In a recent study from Kerulo et al. (2020), the perspective of 239 professionals working in the field of animal-assisted interventions (AAI) was investigated, and it was found that most professionals (88%) were working with dogs.

During therapeutic interventions, dogs can be integrated in an active or passive way. In a study by Hill et al., (2019a, 2019b), dogs were integrated in either an active or a passive way depending on the needs and goals of the client. For example, children diagnosed with autism spectrum disorder were working actively with the dog, playing catch to strengthen the independent performance of the child, while

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other children were working passively with the dog, learning how to recognise emotions. Also, passive AAT programmes for children to enhance their reading skills are commonly used in libraries and schools (Henderson et al., 2020). While the child is reading, the dog is sitting or lying next to the child without further interaction. Another distinction often made in AAT is that the dogs are integrated into individual therapy or group therapy. For example, Wohlfarth et al. (2013) investigated the motivational effects of the active use of dogs in groupwise training for obese children, while Griffioen et al. (2019) studied the changes in synchronicity between children and dogs during individual therapy sessions. A further distinction can be found in the setup of the therapy session. In some studies, AAT is provided by a therapist who is responsible for both providing therapy to the client and handling the dog (e.g. Wijker et al., 2019). In other studies, a therapist provides the therapy but is assisted by a dog handler who is responsible for ensuring the welfare and safety of the dog (e.g. Flynn et al., 2018; Hediger et al., 2019). Also, training and certification of the therapist, handlers and dogs differed across studies.

During the past decade, several attempts have been made to summarise the effectiveness of AAT in children and adults, including children with autism spectrum disorder (Fung & Leung, 2014), adults with autism spectrum disorder (Wijker et al., 2021), children with pervasive developmental disorder (Martin and Farnum, 2002), children with Down syndrome (Griffioen et al., 2019), children who were sexually abused (Dietz et al., 2012) and children with attention-deficit hyperactivity disorder (Juríčková, et al., 2020). Beetz et al. (2021) categorised the outcomes of DAT as (1) improvements in social skills such as empathy and communication (Hill et al., 2019a, 2019b; Stevenson et al., 2015; Wells et al., 2019), (2) psychological effects such as improvements in concentration and motivation (Busch et al., 2016; Hill et al., 2019a, 2019b; Schuck et al., 2013, 2018) and (3) neurobiological effects such as decreases in heart rate and blood pressure (Nagasawa et al., 2015). While most studies on AAT focussed on the effectiveness of dog-assisted therapy (DAT), studies systematically investigating the therapy approaches, settings and research methodology are scarce (Fine et al., 2019).

In line with the rapid increase of AAT providers, several organisations, including Pets Partners, the International Association of Human Animal Interaction Organisation (IAHAIO), Animal Assisted Intervention International and the International Society for Animal Assisted Therapy, were founded to protect and ensure the welfare and wellbeing of the clients, therapists and animals participating in AAT. These organisations have introduced several guidelines for healthcare interventions, including the role and wellbeing of animals. Although these guidelines are regularly used in clinical practice, little is known about how these are applied

in current and past AAT studies. Therefore, the aim of this review is threefold. First, we use the Joanna Briggs Institute checklist (JBIC) to analyse the methodological quality of the studies evaluating DAT in children with behavioural and developmental disorders. Second, we investigate to which extent studies on DAT adhere to the AAT quality criteria developed by the IAHAIO. And third, we summarise the characteristics of the participants, intervention, therapy dogs and outcomes of the studies.

Method

Procedure

Three databases (i.e. *PsycInfo*, *MedLine* and *Eric*) were searched, combining standard terms used in children with behavioural and developmental disorders and AAT with dogs to identify studies (see Fig. 1 for the selection process). Two academic librarian were consulted to develop the following search strings: (Child* or adolescent* or infant* or toddler* or student* or pre-schooler* or puber*) AND (therap* or intervention* or coach* or activit* or consult* or training or education or learning or treatment* AND (dog* assist* or assis* dog* or dog* based or canis or kanis or (therap* adj3 dog*)) OR (animal* assist* or assist* animal* or animal* based or animal*) OR (trained dog* or therapy dog* or service dog*) OR (dog* assist* or assis* dog* or dog* based or canis or kanis or (therap* adj3 dog*))). The search was limited to include only studies published between 2008 and 2020 in peer-reviewed journals and published in English (i.e. 6 years before and 6 years after the publication of the IAHAIO guidelines; Jegatheesan et al., 2018). Duplications were removed, which resulted in 529 studies. Next, the first and second authors screened all titles and abstracts for the four inclusion criteria, which were based on the PICO criteria (Higgins et al., 2019): (1) participants were children between 0 and 18 years of age; (2) a dog was included in the intervention; (3) the interventions were implemented in a therapeutic setting with a healthcare professional, a therapeutic goal and multiple individual therapy sessions; and (4) effects of the interventions on the participants were measured. As pointed out by Chandler (2017) and Seivert et al. (2016), a close relationship between a therapy dog and client is an essential component of DAT. Therefore, we only evaluated individual therapy sessions in this review. Differences between the authors were discussed until consensus was reached.

After the selection process, 13 studies were identified, and the references of these 13 studies were checked for relevant studies. One study that met the inclusion criteria was identified and also included in the review. This resulted in a total of 14 studies that were analysed by the first author.

Fig. 1 Prisma flow chart of data extraction

The second author analysed three (21%) of the included studies. Hill et al., (2018; 2019a, b) described the same research project from different perspectives; these studies were treated as one study. During the selection procedure, interrater reliability between the first and second authors was calculated, using Cohen's K for evaluating the agreement between raters (Cicchetti, 1994). Substantial agreement between the first and second authors was found, $K=0.66$, $p<0.001$ (McHugh, 2012).

Data Analysis

Two forms were used during data extraction. First, the JBIC was used to analyse the quality of the studies according to the current standard for intervention studies. Second, a customised form based on the PRISMA extraction form and IAHAIO Whitepaper was used to evaluate to which extent studies adhered to the quality guidelines of the IAHAIO and to describe the outcomes of the studies. The first author extracted the data of all studies. In addition, the second author analysed three of the included studies to calculate interrater agreement. Substantial agreement was found, $K=0.61$, $p<0.001$ (McHugh, 2012).

Quality of the Studies

The Joanna Briggs Institute checklists (JBIC) for Case Studies (Moola et al., 2020), Qualitative Research (Lockwood et al., 2015), Quasi-Experimental Studies and Randomized Controlled Trials (Tufanaru et al., 2020) were used to evaluate the quality of the study relative to research standards for interventions studies. The JBIC contains different checklists, which measure the methodical quality and risks of bias of the studies (Ma et al., 2020; Xiao et al., 2019). Depending on the study format, the matching checklist of the JBIC was used. By answering 8 to 13 closed-ended questions (depending on the type of study design reviewed by the checklist), the JBIC evaluate the quality of the study design, completeness of the information on the participants and research methods used. The JBIC were chosen because of their availability for all four types of studies covered in the present review and its up-to-dateness. The results are presented in percentages of completeness based on the number of criteria with a range from 0 (information is not described) to 100 (all information is available and described).

AAT Quality Criteria and Outcome

A customised data extraction form was used to extract data related to the IAHAIO criteria and outcomes of the studies. The form was based on the PRISMA checklist and the IAHAIO Whitepaper (Jegatheesan et al., 2018). The PRISMA was chosen to ensure complete and transparent information extraction (Liberati et al., 2009), while the IAHAIO Whitepaper was used to operationalise AAT and as a guideline for the adequate handling of human and dog welfare during the interventions. The form consisted of three components: (1) characteristics of the participants (i.e. gender, age and diagnosis), (2) characteristics of the dog (i.e. breed, gender, age, colour, neutered/pregnant, owner) and (3) outcome variables (see Table 1).

Results

The Current Standard for Intervention Studies

Of all 14 studies, 9 used a quasi-experiment design, and 3 used a randomised control trial design. Also, 1 case study and 1 qualitative study were included. The qualitative study had the highest quality score on the JBIC, with 90% of the criteria completed. The 3 randomised controlled trials scored on average 74% (range: 69–77%). The studies that used a quasi-experimental design ($n = 9$) had a mean score of 62% (range: 44–78%), and the case study had the lowest score with 50% of the criteria completed on the JBIC. According to the JBIC criteria, most studies reported sufficient information about the participants. However, only 6 studies used a control group. Most control groups received a similar treatment as the experimental group but without a dog, making blinded rating difficult. The JBIC scores of the individual studies can be found in Table 2.

AAT Quality Criteria

To assess to which extent the studies adhered to the AAT quality criteria (Jegatheesan et al., 2018), the characteristics of participants, dogs, professionals and intervention were summarised first.

The number of participants ranged from 1 to 117. It included children diagnosed with autism spectrum disorder (11 of the 14 studies), children in paediatric care (2 studies), incarcerated youth (1 study) and participants with Down syndrome (2 studies). One of the latter two studies included both children with autism spectrum disorder and Down syndrome. The age of the participants ranged from 4 to 19 years, and most participants were boys (70%). The therapeutical orientation was mentioned in 6 studies, including occupational therapy (2 studies) and applied behaviour analysis (1 study). Characteristics of the studies are summarised in Table 2.

In the 14 studies, between one and eleven dogs were used. In line with the IAHAIO-criteria, the studies were screened on the following 6 characteristics of the dog: (1) breed, (2) gender, (3) age, (4) colour, (5) neutered/pregnant and (6) and dog-owner (see Table 2). In most studies, information regarding the characteristics of the dogs was scarce. Of the six characteristics, most studies reported fewer than three, with an average of 2.5 characteristics. In 6 studies, a triadic setting (i.e. dog, child and therapist) was used, while in 5 studies, a dog handler was added, and a quadratic setting was used (i.e. dog, dog handler, child and therapist). In three studies, this information was not reported.

In the IAHAIO Whitepaper, nine criteria are identified to protect the welfare of the participants and the dogs (Table 1). The first three criteria focussed on the welfare and background of the participants and the other six on the welfare, training and handling of the dog. All studies reported information on one or more of the first three criteria that were related to the welfare and background of the participants. Eight studies reported that participants were checked on

Table 1 Characteristics of participants and dogs and IAHAIO criteria

<i>AAT quality criteria and outcome</i>	
<i>Participant's characteristics</i>	Age, gender and diagnosis
<i>Dog's characteristics</i>	Age, gender, breed, colour, neutered/pregnant, owner
<i>IAHAIO guideline</i>	(1) participants are not allergic to dogs; (2) professional is certified to provide therapy to children; (3) cultural background of participants is known; (4) dogs used during therapy are socialised; (5) dogs are registered therapy dogs; (6) evaluation of the dog's behaviour; (7) dogs have been checked by a veterinarian; (8) therapist or handler is certified for working with dogs; and (9) duration of therapy session is between 30 and 45 min
<i>Outcome</i>	Social, psychological, neurobiological

Based on IAHAIO White Paper (Jegatheesan et al. 2018)

Table 2 Studies sorted by Intervention, quality, AAT criteria and outcome

Study	Intervention				Quality of the study		AAT characteristics and criteria				Outcome		
	Country	Sample size	Study design	Type therapy	Sessions	JBIC (0–100)%	Professionals	Dogs characteristics (total number of dogs)	Participants characteristics	Conform IAHAO criteria	Social	Psychological	Neurobiological
1 Jorgenson et al. (2020)	USA	5	Quasi-experiment	Not reported	19–23×30–60 min	44%	Therapist and handler	3 (N=3)	4–8 years ASD	No	X*		
2 London et al., (2020)	Australia	17	Qualitative study	Occupational therapy/speech pathology	5×60 min	90%	Therapist and handler	2 (N=11)	4–19 years ASD	No		X	
3 Protopopova et al., (2020)	USA	5	Quasi-experiment	Applied behaviour analysis	19–23×30 min	56%	Therapist	1 (N=3)	8–11 years ASD	Unclear	X	X	X
4 Griffioen et al., (2019)	The Netherlands	10	Quasi-experiment	Exercises and methods according to CATC dog-assisted therapy	6×30 min	78%	Therapist and handler	2 (N=2)	11–18 years ASD	Yes	X*		
5 Hill et al., (2019a, 2019b)	Australia	22	Randomised control trial	Occupational therapy	7×60 min	69%	Therapist	3 (N=1)	4–6 years ASD	No		X	
6 Machova et al., (2018)	Czech Republic	69	Randomised control trial	Speech and language therapy	23–37×45 min	77%	Therapist	5 (N=1)	4–7 years Communication impairments	Yes	X*	X*	
7 Seivert et al., (2016)	USA	117	Randomised control trial	Teacher's pet	20×60 min	77%	Therapist and handler	4 (N=not reported)	13–18 years No diagnosis	No	X	X	
8 Vitzum et al., (2016)	USA	7	Quasi-experiment	Not reported	15×60 min	56%	Therapist	0 (N=1)	11–14 years Orthopaedic limitations	No	X	X*	

Table 2 (continued)

Study	Intervention			Quality of the study			AAT characteristics and criteria				Outcome		
	Country	Sample size	Study design	Type therapy	Sessions	JBIC (0–100)%	Professionals	Dogs characteristics (total number of dogs)	Participants characteristics	Conform IAHAO criteria	Social	Psychological	Neurobiological
9 Barker et al., (2015)	USA	40	Quasi-experiment	Not reported	24 × 10 min	78%	Therapist and handler	0 (N=7)	8–17 years Hospitalised children	Unclear		X	
10 Stevenson et al., (2015)	UK	3	Case study	Not reported	5 × 20 min	50%	Therapist	1 (N=1)	7–13 years ASD	No	X	X	
11 Fung and Leung (2014)	Hong Kong	10	Quasi-experiment	Play therapy	14 × 20 min	56%	Therapist	3 (N=2)	7–10 years ASD	Unclear	X*		
12 Grigore and Rusu (2014)	Romania	3	Quasi-experiment	Social stories	24 × 15 min	67%	Therapist and handler	3 (N=1)	7–8 years ASD	Unclear	X*		
13 Funahashi et al., (2013)	Japan	1	Quasi-experiment	Not reported	4 × 30–40 min	78%	Therapist	1 (N=6)	10 years ASD	No	X		
14 Silva et al., (2011)	Portugal	1	Quasi-experiment	Not reported	6 × 45 min	44%	Therapist	5 (N=1)	12 years ASD	Yes	X*		

A general note. X: effects investigated. *: significant effects

dog-related allergies, and in 12 studies, the education of the therapist who provided AAT was reported. Only one study reported the cultural background of the participants. Most studies reported scarce information on the six criteria related to the characteristics and welfare of the dog (i.e. breed, gender, age, colour, neutered/pregnant and owner). The most shared information about the therapy dogs was that they are socialised (10/14), registered as therapy dog (9/14), evaluated (7/14) and veterinarian checked (5/14). Twelve studies also reported that the therapist and/or dog handler were educated and certified in dog training and/or handling. All studies reported the duration of the sessions. However, most studies did not report breed, colour, age or gender and also five of the 14 studies described therapy sessions with a longer duration (i.e. 60 min) than prescribed in the IAHAIO criteria (i.e. 30–45 min).

Only three studies adhered to all AAT criteria, seven did not adhere to the criteria. Four studies reported insufficient information to assess if AAT criteria were followed. Of the three studies that adhered to the guidelines, two were published before the publication of the guidelines (Jegatheesan et al., 2018). Of the eight studies that were published after the publication of the AAT criteria, only one study was designed in line with these guidelines. Although two studies referred to the IAHAIO guideline, both studies did not meet the criteria. Only five studies reported that a treatment protocol or manual was used.

The Outcome of the Studies

To evaluate the outcomes of the studies, the data were summarised and categorised into three domains. Table 2 depicts the outcomes on the three domains of effectiveness proposed by Beetz et al. (2021): social, psychological and neurobiological. Most studies (78%) reported outcomes on the social domain, including increased social and communication skills and reduction in aggressive behaviours. Ten studies (71%) reported psychological outcomes, including more motivation and concentration. Only one study evaluated the neurobiological outcomes of DAT and found reductions in salivary cortisol levels in five children (Protopopova et al., 2020). Six of the 14 studies (43%) reported significant outcomes of DAT, whereof six in the social domain and two in the psychological domain. Most studies also reported anecdotal outcomes such as improved motivation or reduction of aggressive behaviour.

Discussion

This systematic review aimed to evaluate the methodological quality of studies investigating DAT in children with behavioural and developmental disorders and the extent to which these studies adhered to quality guidelines of IAHAIO

(Jegatheesan et al., 2018). Also, characteristics of participants, intervention, therapy dogs and outcomes were summarised. The quality of the 14 included studies was evaluated using two checklists. The overall methodological quality of the studies was evaluated using the JBIC, and the criteria of the IAHAIO were used to assess if studies adhered to the guidelines for human and animal welfare in AAT. Forty-four to 90% of the criteria of the JBIC were met, which is in line with other studies that assessed the methodological quality with the JBIC. For example, Kanninen et al., (2021) evaluated interventions for strengthening professionals' governance in nursing in hospitals and found that 55 to 89% of the criteria were met. Xiao et al. (2019) reviewed studies on the effect of therapy on dignity, psychological wellbeing and quality of life among cancer patients. With 62 to 89% of the criteria met, none of the studies included in their review fulfilled all JBIC criteria (Xiao et al., 2019). JBIC scores of the 14 included studies indicated low to moderate methodological quality.

While in most studies all JBIC criteria regarding the participants were met, criteria regarding the randomisation and blinding of the assessors were not met. Furthermore, it was difficult to extract data related to the intervention as many studies did not report sufficient information regarding the intervention and control conditions. Often, no information regarding theories underlying the intervention, the treatment protocol, and intervention techniques was given, and treatment integrity and procedural fidelity were often not measured. Included studies were characterised by a high degree of heterogeneity regarding the participants, the intervention and the control conditions used. Although all studies investigated DAT, the number of sessions varied from 4 to 37 and duration of the sessions varied between 5 and 60 min. Also, the therapeutic function and tasks of the therapy dog differed across studies. While in the study of Seivert et al. (2016) the interaction between the dog and the child was integrated into the therapy programme, Protopopova et al. (2020) used the therapy dog as a reinforcer for the participation of the child in an educational task. Most studies provided little information on the treatment and the procedures related to the dog's role in the treatment and setting of the treatment. No study measured the long-term effects of DAT.

The IAHAIO is the global association of organisations that engage in AAI. Their criteria for AAI outline the best practices in delivering DAT to ensure the health and wellbeing of both clients and therapy dogs. As these criteria are seen as the golden standard in clinical practice, they were used to evaluate the quality of DAT provided in the included studies. As no clear definition, description and protocol of DAT exist, recommendations of the IAHAIO were summarised based on nine criteria to evaluate the quality of the intervention. Unfortunately, interventions often did not adhere to these criteria or information related to these criteria was lacking, making it impossible to determine if studies

adhered to the criteria. For example, the criteria state that sessions should be time-limited (30–45 min) to prevent the dogs from becoming overworked or overwhelmed. However, five of the 14 studies reported sessions longer than 45 min (Hill et al., 2019a, 2019b; Jorgenson et al., 2020; London et al., 2020; Seivert et al., 2016; Vitztum et al., 2016). In addition, AAI should only be performed with the assistance of animals in good health, well-socialised with humans and trained adequately with humane techniques (Jegatheesan et al., 2018). While Seivert et al. (2016) referred to the IAHAIO criteria, they used dogs from an animal shelter. These dogs had behavioural issues such as jumping and pulling and lacked socialisation. Often, characteristics of the dogs, such as their age or veterinarian checks, were not reported, making it difficult to conclude if studies adhered to the IAHAIO criteria.

The therapy dog is a crucial element in DAT. Clear protocols are needed to ensure the wellbeing and safety of clients, therapists and dogs (Jegatheesan et al., 2018) and to operationalise DAT further. However, little information on the dogs was provided in the current studies. Only some studies provided some information about the dog's characteristics, the dog's role during the therapy session and the treatment location and materials. For example, the dog can be used to reinforce the social behaviour of a child instead of using edible and/or social reinforcers provided by the therapist (Protopopova et al., 2020). However, the dog can also participate and interact with the child during a task or exercise (Hill et al., 2019a, 2019b). While characteristics of the dogs, such as breed and colour, might influence the effectiveness of DAT, most studies lacked data on these characteristics. For example, colour differences might influence the outcomes of DAT. Lavan and Knesl (2015) showed that black dogs remained longer in shelters than dogs with other colours because black dogs look more menacing and are more difficult to read during interactions. It is essential to report these characteristics to compare outcomes between studies and learn more about the effect in DAT.

Seven of the 14 studies identified significant effects of DAT. Furthermore, in the qualitative study, parents and therapists reported that children were more engaged, showed more enjoyment, and were more motivated in the therapy dog's presence (London et al., 2020). In addition to the quantitative outcomes, many studies reported anecdotal outcomes, such as increased motivation and decreased aggressive behaviour (London et al., 2020). Since most of these studies did not measure increased motivation and decreased aggressive behaviour, future studies should investigate these effects using valid and reliable measures and study designs.

Limitations and future research

Although the findings of the present review show that DAT is a promising intervention for children with behavioural and developmental disorders, the results also emphasise that more

robust research methods are warranted to strengthen the current knowledge base. To further advance the field, future studies must include a clear description of the treatment components and the role of the therapy dog in the intervention. Also, the context wherein DAT is provided should be clearly described to enhance the replicability of the results. Therefore, clear guidelines need to be developed that describe the characteristics of participants, therapy dogs and interventions that should be reported in interventions studies with animals. As treatment integrity and procedural fidelity of DAT were often not assessed and different outcome measures were used, it is not easy to compare and generalise the results between studies. Future studies should include measures on treatment integrity and procedural fidelity and measures to evaluate the short-term and long-term effectiveness of DAT. As several studies reported anecdotal outcomes such as improved motivation or reduction of aggressive behaviour, future studies should include measures on these outcomes. Furthermore, qualitative studies should analyse the experiences reported by therapists and children, while observational study designs could be employed to get more insight into the underlying theories and working mechanisms of DAT. These findings may be limited because the information needed to analyse the IAHAIO criteria was lacking in some studies.

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Author Contribution C. J. H.: designed the study, conducted the literature search, analysed the studies, and wrote the manuscript. N. P. S.: assisted in the data analyses, and collaborated in designing and writing the study. R. D.: collaborated in designing, writing, and editing the paper. All authors approved the final version of the manuscript before submission.

Declarations

Conflict of Interest The authors declare no competing interests.

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